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A PECTIN-AGAR PREPARATION FOR TREATMENT OF DIARRHEA OF INFANTS

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In a previous publication [1] the use of scraped raw apple in the treatment for diarrhea of infants was presented. In that work several objections to the scraped raw apple treatment were observed. First, a good grade of ripe apples was scarce in the diarrhea season; second, the expense was relatively high, and third, the nursing care involved was excessive when several infants were being fed the apple diet. With these objections in mind, a substitute was devised that retained all of the good points of apple and overcame some of the objections.

From the work of Malyoth [2] and others,[3] it seems that pectin and cellulose are the two active principles in apple so far as therapy of diarrhea is concerned. With this thought in mind, a substitute was formulated using these two ingredients as therapeutic agents, and a dextrin-maltose preparation was added as a source of calories. Pectin from the peelings of citrous fruits was used. An acid-free pectin was purposely chosen so that no therapeutic action might be attributed to the acid.

Agar-agar was chosen as a desirable source of cellulose, having the advantage of furnishing a gel of almost any consistency desired. Furthermore, since it does not melt at body temperature, the gel state is retained as it passes through the gastro-intestinal tract. The preparation of agar-agar chosen was finely ground and therefore readily soluble.

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TABLE 1.—*Data on Patients*

Case No.	Age	Length of Illness Before Present Therapy	No. of Stools Daily Before Present Therapy	No. of Days of Substitute Treatment	No. of Days Required for Transition to Regular Diet	No. of Days Stools Were Liquid	Mucus, Days Present	Blood, Days Present	Pus, Days Present	Recurrence	How Well Treatment Was Taken*	Diagnosis and Complications
1a	13 mo.	4 wk.	8-12	1½	5	½	0	0	0	Yes	F	Fermentative diarrhea
2a	2 yr.	1 day	12-15	1	0	1	0	0	0	No	E	Fermentative diarrhea
3a	10 mo.	3 wk.	6-10	2	4	1	0	0	0	No	E	Fermentative diarrhea
4a	9 mo.	10 days	15-25	7	7	1½	0	0	0	No	E	Fermentative diarrhea
5a	3½ days	10 days	6- 7	3	3	1	0	0	0	No	F	Parenteral pneumonia
6a	2 yr.	7 days	20	8	2	½	2	2	0	No	F	Flexner's dysentery
7a	6 yr.	5 days	25	3	3	½	1	1	0	No	E	Sonne's dysentery
8a	14 yr.	1 day	12-15	1½	1	1	0	0	0	No	F	Tumor of the brain; fermentative diarrhea
9a	13 mo.	3 days	8-10	2	2	½	0	0	0	No	E	Fermentative diarrhea
10a	3½ yr.	1 day	12-20	3	6	3	3	2	1	No	E	Flexner's dysentery
11a	8½ mo.	4 days	7- 9	6	0	4	0	0	0	No	F	Otitis media; parenteral pneumonia
12a	15 mo.	9 days	15	2½	3	½	0	0	0	Yes	F	Sonne's dysentery
13a	8 mo.	28 days	14	10	0	6.3	0	0	0	No	P	Flexner's dysentery
14a	6 mo.	3 days	20	2	2	0	2	2	2	No	P	Otitis media with pneumonia; Flexner's dysentery
15a	3 yr.	7 days	7- 8	7	2	1½	6	6	0	No	F	Flexner's dysentery
16a	11 mo.	5 days	15-20	4	7	1½	1	1	0	No	P	Fermentative diarrhea
17a	10 mo.	2 wk.	6- 7	4	2	1	0	0	0	No	F	Fermentative diarrhea
18a	10 mo.	3 days	9	4	2	0	0	0	0	No	E	Fermentative diarrhea
19a	20 mo.	2 wk.	15	1	0	1	2	2	2	No	P	Otitis media; Flexner's dysentery; pneumonia
20a	5 mo.	10 days	20-25	3½	0	2½	2	0	0	No	F	Parenteral pneumonia
21a	14 mo.	6 days	12	11	3	6	3	3	0	No	F	Flexner's dysentery
22a	2½ mo.	8 wk.	4½	11	2	0	0	0	0	No	E	Sonne's dysentery
23a	4 mo.	2 wk.	5- 8	5	24	1	0	0	0	Yes	E	Flexner's dysentery
24a	9 mo.	3 days	7- 8	8	9	2	0	0	0	No	E	Parenteral pneumonia

* E indicates excellent; F, fair, and P, poor.

TABLE 2.—*Data on Patients*

Case No.	Age	Length of Illness Before Present Therapy	No. of Stools Daily Before Present Therapy	No. of Days of Substitute Treatment	No. of Days Required for Transition to Regular Diet	No. of Days Stools Were Liquid	Mucus, Days Present	Blood, Days Present	Pus, Days Present	Recurrence	How Well Treatment Was Taken*	Diagnosis and Complications
1b	5 mo.	3 days	6- 8	4½	2	1½	0	0	0	No	E	Otitis media; parenteral tetany
2b	5 wk.	4 days	6- 8	1	2	1	0	0	0	No	P	Otitis media; parenteral pneumonia
3b	11 mo.	.....	.....	10	0	10	0	0	0	No	G	Aplastic anemia; fermentative diarrhea
4b	3 mo.	2 days	10	3	7	1	0	0	0	No	F	Fermentative diarrhea
5b	11 mo.	4 days	6- 8	4	..	½	1	1	0	No	E	Infection of upper respiratory tract; parenteral pneumonia
6b	8 mo.	14 days	8-10	7	5	11	0	0	0	No	E	Sonne's dysentery
7b	11½ mo.	3 days	8-10	3	7	½	0	0	0	No	E	Fermentative diarrhea
8b	10 mo.	2 wk.	6- 7	2	2	½	0	0	0	Yes	P	Parenteral infection
9b	10 mo.	1 day	10	2	0	3	0	0	0	Yes	P	Extrophy of the bladder; prolapse of the rectum; fermentative diarrhea
10b	2½ mo.	14 days	5- 6	7½	0	2	0	0	0	Yes	E	Otitis media; parenteral pneumonia
11b	7 mo.	14 days	10	23	8	4	0	1	0	Yes	F	
12b	4 mo.	2 wk.	5- 8	4	14	2	0	0	0	Yes	E	Flexner's dysentery
13b	9 mo.	1 day	5	3	8	1	0	0	0	Yes	E	Parenteral pneumonia
14b	5 yr.	2 days	15-20	12	12	8	8	8	0	No	P	Flexner's dysentery
15b	8 mo.	10 days	10	1	18	4	0	0	0	No	F	Sonne's dysentery
16b	4 yr.	4 days	6- 8	4	2	0	0	0	0	No	F	Fermentative diarrhea
17b	6 mo.	3 days	20	2	0	2	2	2	2	No	P	Flexner's dysentery
18b	9 mo.	14 days	5-10	17	34	21	0	0	0	No	F	Acute mastoiditis; parenteral pneumonia

* E indicates excellent; F, fair; P, poor, and G, gavage.

Treated with the Substitute

Gain or Loss, Ounces per Day	Blood: Guanidine	Blood: Carbon Dioxide Comb. Power, Vols. %	Blood: Calcium, Mg. per 100 Cc.	Blood: Sugar, Mg. per 100 Cc.	Urine: Casts	Urine: Pus Cells	Urine: Albumin	Blood Count: Red Cell Count	Blood Count: Hemoglobin Content, Gm.	Blood Count: Total	Blood Count: Lymphocytes	Blood Count: Polymorphonuclears
G 2.2	...	....	..	...	0	0	0	3,910,000	9.5	9,300	36	56
G 5.7	...	....	..	...	..	1-2	..	4,600,000	....	22,800	44	48
.....	0.8	28.0	11	...	Loaded	Loaded	Trace	3,760,000	10.5	31,300	64	33
.....	0.4	....	11	159	0	3-5	Trace	4,100,000	11.0	15,800	42	58
G 2.5	1.2	43.0	11	192	0	1-2	0	4,600,000	11.0	16,100	24	70
.....	0.2	47.0	10	165	0	0	0	5,000,000	12.0	8,200	32	68
.....	...	....	..	...	0	Occasional	0	4,540,000	12.5	14,400	18	78
.....	...	43.0	12	108	0	0	Trace	4,130,000	10.5	7,700	50	46
.....	0.3	53.2	..	...	0	0	0	3,910,000	....	5,750	40	46
G 3.3	...	24.0	12	108	0	20-25	Trace	3,980,000	10.5	8,500	46	44
.....	0.8	45.0	11	125	0	Occasional	0	3,580,000	....	9,600	76	24
G 1.2	0.35	60.0	12	105	Occasional	12-15	Slight trace	4,290,000	10.5	18,100	12	84
.....	2.5	57.9	17	139	0	Occasional	Slight trace	4,420,000	....	15,600	55	42
L 2.2	0.2	53.0	11	81	0	1-2	Trace	4,200,000	....	13,500	42	58
L 2.0	...	....	..	...	Few	Occasional	0	3,990,000	....	23,300	50	24
G 3.0	...	42.0	14	81	0	1-2	Trace	2,270,000	....	.....	56	44
.....	1.2	....	..	...	..	2-3	..	.....	11.0	18,900	9	90
.....	0.35	....	..	139	..	..	Trace	4,740,000	....	20,600	28	72
G 4.1	0.8	36.0	..	108	0	15-20	Trace	5,950,000	....	22,850	30	70
G 2.1	0.3	31.0	0	87	0	50-60	Slight trace	3,530,000	10.0	29,250	31	62
L 0.3	...	....	..	...	0	Occasional	0	3,750,000	....	5,250	70	30
G 2.1	...	....	..	...	0	0	0	4,280,000	12.0	6,650	40	60
.....	...	....	..	...	..	..	..	.....	....	.....	..	..
.....	...	....	..	...	..	..	..	.....	....	.....	..	..

Treated with Apple

Gain or Loss, Ounces per Day	Blood: Guanidine	Blood: Carbon Dioxide Comb. Power, Vols. %	Blood: Calcium, Mg. per 100 Cc.	Blood: Sugar, Mg. per 100 Cc.	Urine: Casts	Urine: Pus Cells	Urine: Albumin	Blood Count: Red Cell Count	Blood Count: Hemoglobin Content, Gm.	Blood Count: Total	Blood Count: Lymphocytes	Blood Count: Polymorphonuclears
L 0.4	0.8	....	..	83	0	Occasional	..	3,640,000	10.0	14,300	66	26
L 1.0	0.35	50.0	..	64	0	2-3	Occasional trace	3,920,000	....	9,200	54	34
L 4.4	...	....	..	...	..	..	..	8,200,000	....	15,300	..	..
.....	0.3	39.0	..	67	0	Occasional	Trace	4,710,000	....	4,700	..	..
L 2.5	...	....	..	...	..	..	..	3,800,000	....	7,480	53	45
L 3.7	...	....	11	100	0	Occasional	0	3,990,000	8.5	13,600	58	90
L 7.5	1.2	35.0	11	118	0	Occasional	0	4,600,000	12.5	5,100	29	61
L 2.0	...	42.0	14	81	0	1-2	Trace	2,270,000	....	.....	56	44
L 7.1	...	....	..	...	0	0	0	3,930,000	15.0	.....	52	43
L 4.0	0.3	31.0	0	87	0	50-60	Slight trace	3,520,000	....	29,250	31	62
L 1.7	...	....	..	...	0	0	0	2,270,000	....	10,300	59	43
L 2.4	...	....	..	...	0	0	0	3,680,000	....	8,850	54	42
.....	...	....	..	...	0	0	0	4,790,000	12.0	20,650	46	48
.....	0.3	36.0	11	111.7	0	10-12	Trace	4,400,000	12.0	7,350	49	66
L 1.1	0.4	43.7	11	...	0	45	Trace	5,900,000	7.5	8,850	48	38
....	...	36.0	10	86	0	2-3	0	4,100,000	....	11,400	30	70
.....	...	....	..	...	0	2-3	0	3,100,000	....	13,150	50	48
0.1	...	....	..	...	0	Occasional	Trace	4,340,000	....	14,150	20	80

The following formula was designed:

Dextrin and maltose	175 Gm.
Pectin	6 Gm.
Agar-agar	8 Gm.

These substances are mixed together dry. The end-product is not noticeably hydroscopic and will keep for an indefinite period. The cost is surprisingly low. This formula is designed to contain pectin in about three times the amount found in apple. The agar-pectin ratio is such that when a pint of milk or water is added to the preparation a smooth, self-supporting gel results. This preparation is referred to in this report as the substitute. The water or milk is boiled with the agar and pectin mix over an open flame for from three to five minutes. While still hot it is poured into eight custard cups. This constitutes a day's feeding on a three hour schedule. If the substitute is made with water, the total number of calories will be 700; if it is made with whole milk, 1,020. The preparation made with whole milk is a highly concentrated food, as each feeding is 2 or 3 tablespoonfuls. If fat is not desired, skimmed milk may be used. Various flavors may be used, including vanilla, chocolate and fruit. Colors may also be used. Some very palatable preparations may be so designed. For small children, flavors are unnecessary, as the standard substitute is usually readily taken. But for older children the use of colors and flavors constitutes a simple means of presenting an attractive, tasty and nutritious therapeutic food. Special feedings may be designed with the substitute as the vehicle. The feeding can be made more concentrated by using powdered milk and by decreasing the amount of liquid.

PLAN OF EXPERIMENTATION

Apple-treated patients were chosen as controls. So far as possible the patients were treated in rotation. All subsidiary management was handled by members of the inside staff, who were not supposed to know which diet was being used. In the event of a poor response to one diet, the other was tried.

Accurate data were kept as to the number and types of stools. Likewise, in selected cases, records of the exact caloric intake, cost of the diet, weight and other data were kept. This information was kept and recorded by a dietitian,[4] with the aid of a nurse. Other details were carried out as shown in tables 1 and 2.

Routine proctoscopic examinations were made. First, a direct smear taken from the wall of the bowel was examined for protozoa. After this, the rectum was flushed with a physiologic solution of sodium chloride, and a smear was taken for plating. This procedure was repeated for three consecutive days before the findings were considered negative. All specimens were examined within one hour after collec-

4. Darby, Clara R.: To be published.

tion. The usual morphologic, cultural and serologic studies for the identification of suspicious organisms were made.[5]

Special studies were also made of the blood chemistry, including the carbon dioxide-combining power and the content of sugar, calcium and guanidine. This investigation was stimulated by the work of Minot and his co-workers.[6]

MANAGEMENT OF PATIENTS

Either the apple or the substitute treatment was instituted on the patient's admission, with occasional exceptions. Nothing else was given by mouth, except a 5 per cent solution of dextrose. In the course of our studies we learned something of the problems of feeding technic and became convinced of the importance of good nursing care for infants with diarrhea. We found it important to consider that the most severely ill infants do not want to eat, while it is essential for a successful outcome that they be fed. Most infants ate voluntarily after some improvement. However, very young infants who were not spoon broken needed to be bottle fed. The substitute can be given, as can thick cereal feedings, by cutting a large hole in the end of the nipple. If the infant had to be fed by force, a metal ear syringe was used to place the preparation far back on the tongue, the nose being held until the food was swallowed. In some instances water was offered; but since it often caused regurgitation, it was found preferable in most cases not to give water at the time of feeding.

OBSERVATIONS

This series included forty-two infants, of whom twenty-four were fed the substitute and eighteen were fed scraped raw apple. (For clinical and laboratory data see tables 1 and 2.) Several interesting observations can be made. In general, the infants treated with the substitute were more seriously ill than those treated with apple. The average number of stools per day prior to treatment was nine and nine-tenths in the group treated with apple and thirteen in the group treated with the substitute. The tables show that although the infants of the group given the substitute were more ill at the onset, they responded better. The apple-fed group required an average of six and one-tenth days on straight treatment, while the other group required an average of four and seventy-nine hundredths days. The patient responded in much less time than this average would indicate. The stools were liquid for only one and three-tenths days on an average in the group treated

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with the substitute, while in the group treated with apple, they were liquid for four and one-tenth days. The average time for transition to a regular diet was seven and one-tenth days for the apple-fed series but only three and nine-tenths days for the substitute-fed series. The transition to a milk formula from an apple diet often causes an exacerbation and needs to be slow.[2] Less caution seems to be required in the transition from the substitute formula. The shortening of the transition period does much toward decreasing the length of stay in the hospital and preventing the loss of weight so common with the use of dilute milk formulas. The group fed the substitute showed an average gain in weight of 50 Gm. per day, while the group given the apple diet lost an average of 72 Gm. per day. Practically all of the group received the substitute preparation made of whole milk, which, in most instances, was tolerated very well.

It is noteworthy that the weight was better maintained during the transition period from the substitute diet than from the apple diet. This is explained by the fact that diets with a higher caloric value were tolerated by the group treated with the substitute. As a whole, the apple was not taken as readily as the substitute. When the substitute was refused the apple also was refused, while in some instances the substitute was taken when apple was refused. Ten patients were infected with the Flexner dysentery bacilli and five with the Sonne dysentery bacilli. These patients responded more slowly, as a whole. Blood, pus and mucus disappeared in slightly less time from the stools of patients of the substitute-treated group than from those of patients of the apple-treated group. We were not able to confirm Kollmann's [7] observation that an apple diet tended to produce casts in the urine. In a number of cases the diarrhea stopped for a time before the substitute or apple had had time to pass through the gastro-intestinal tract. As Birnberg has suggested, there must be some factor in these diets which allays peristalsis. The blood of the patients with a condition typical of alimentary intoxication showed a high guanidine content and a low carbon dioxide-combining power. The blood sugar content tended to be low. Those patients with a blood sugar content above normal had received dextrose intravenously. This group of patients showed some improvement on administration of calcium intravenously with dextrose and a physiologic solution of sodium chloride. There were no reactions to transfusions such as those discussed by Minot, Dodd and Bryan and mentioned in a previous paper.[1] The youngest patient was 2½ months of age and responded excellently to the substitute treatment.

COMMENT

The last word has not yet been written on therapy for infantile diarrhea, but this pectin-agar diet would certainly seem to promise

(Footnote continued on next page)

additional help in cases of this condition. Certainly, its ability simultaneously to control diarrhea and promote gain in weight is not to be minimized. The substitute, as a whole, is more readily taken, owing to its adaptability to individual requirements, through flavoring, coloring and changes in consistency. It is much more adaptable in some cases than is apple. The preparation can be given in small or large bulk, in firm or soft gels and in concentrated or dilute feedings; and the carbohydrate, fat, protein and vitamin contents can be altered. It is more economical in original cost, with less likelihood of waste. It is, in itself, a good source of calories. The diet is extremely easy to prepare and much more convenient to manage from the point of view of nursing, as it is no easy matter to scrape apples for a large group of infants on a three hour schedule. The prepared gel keeps indefinitely in an icebox, and the powder keeps well. Apples cannot be given in a sterile condition, whereas the substitute is easily kept sterile after preparation. Certainly, feeding raw apples is a rather unsanitary procedure, not compatible with present thought on feeding infants. Apples are not always readily available, especially in rural districts where the fruit is not raised. The harvest of quality apples does not occur until the diarrhea season is nearly over. The substitute treatment has a psychologic advantage also; the parents feel that the baby is getting a "medicine." The period of hospitalization will usually be shorter with the substitute diet than with the apple diet, for reasons already stated. The substitute is more amenable to various feeding methods in cases of stubborn diarrhea. It is to be remembered that it is possible for infants to have liquid apple stools. The substitute was never observed to pass through the gastro-intestinal tract as a liquid unless it was diluted with water on administration. For this reason it would seem to be more effective in maintaining the water balance than the apple diet. It is noteworthy that the substitute treatment seems to be effective against all types of infantile diarrhea.

SUMMARY AND CONCLUSIONS

Objections are raised to scraped raw apple as a treatment for diarrhea.

A substitute is offered, made with pectin, agar-agar and a dextrin-maltose preparation.

Observations and data are recorded on twenty-four patients treated with this substitute and on eighteen patients treated with scraped raw apple.

Data are offered to show that the group treated with the substitute responded better than the group fed scraped raw apple.

7. Kollmann, A.: Apple Diet in Diarrhea of Infants and Children, Med. Welt **4**:1067, 1930.

BASAL METABOLISM OF TUBERCULOUS CHILDREN

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There is known to be an increase in metabolism in all infections. As fever is nearly always present, it is difficult to say whether this increase is due to the fever or to other factors. It is known that fever produces a rise in basal metabolism—a rise which follows van't Hóff's law, which may be stated as follows: With an increase in temperature of 10 C. (18 F.), the velocity of chemical reactions increases between two and three times. DuBois [1] studied the metabolism in the various fevers and found that in 90 per cent of them the course closely followed this law. The increase in metabolism associated with fever is largely the result of the toxic destruction of protein which occurs more or less in all infections. The more toxic the condition, the greater the destruction of body protein, and the higher, therefore, the metabolism.

In febrile tuberculosis the increase in metabolism is relatively lower than it is in other infections with the same degree of fever. This may be due to the fact that in tuberculosis, even when the temperature is high, there are often few signs of toxemia and slight destruction of protein. The excretion of nitrogen, which may be taken as an index of the destruction of protein, although higher than normal, is lower in tuberculosis than, for example, in pneumonia, typhoid, erysipelas or scarlet fever. McCann and Barr [2] found a normal specific dynamic action in tuberculosis—a fact which we have corroborated in our own studies. In conditions in which destruction of protein has occurred, for example typhoid, the specific dynamic action is decreased, because the ingested protein, instead of being burned immediately, is used to replace the depleted protein stores. The normal specific dynamic action in tuberculosis affords evidence that the protein stores of the body have not been depleted; hence ingested protein is not used for replacement purposes but is burned immediately, as it is under normal conditions.

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A preliminary report of this work was made at a meeting of the Section of Pediatrics of the New York Academy of Medicine, New York, Jan. 10, 1935.

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2. McCann, W. S., and Barr, D. P.: Clinical Calorimetry: Metabolism in Tuberculosis, Arch. Int. Med. **26**:663 (Dec.) 1920.

The influence of infection per se on the basal metabolism, dissociated from the effect of fever, can be studied only in conditions in which active disease exists without fever. Tuberculosis, a chronic disease in which there may be long periods of apyrexia associated with active infection, lends itself to such a study.

Most of the studies of the basal metabolism in tuberculosis reported in the literature have been made on tuberculous adults. McCann and Barr,[3] in a study of 10 afebrile adults, found a range in the basal metabolic rate of from minus 3 per cent to plus 15 per cent. Barbour [4] noted normal rates in 3 afebrile tuberculous adults. Kocher [5] reported normal rates for a series of 15 afebrile patients studied at the Trudeau sanatorium. Opposed to these observations are those of Grafe,[6] who found an increase in metabolism in 7 of 10 afebrile, severely ill tuberculous patients. These patients were studied for long periods in a respiration chamber, and McCann expressed the belief that, since it is difficult for such sick patients to remain quiet for long periods, the increase in their metabolism might be explained on the basis of restlessness and coughing. Grafe, however, said: "The question of restlessness does not enter, as, for the most part, the patients were so tired and ill that they were extraordinarily quiet. Restless and dyspneic patients were not tested." Wells [7] stated that Grafe's values were too high, because in such emaciated patients the surface area is reduced and all figures calculated on this basis would necessarily be too high.

Gekler and Weigel,[8] in a group of 80 tuberculous adults, found the basal metabolism to be essentially normal. Frank and Safarik [9] studied a group of 128 patients and found normal metabolism in the majority. McMahon and Klein [10] divided their group of 87 patients into those with incipient, those with moderately advanced and those with very advanced tuberculosis. He reported normal metabolism in the first group, a slight increase in the second and a definite increase in the third. Similarly, other investigators have sometimes found an increase in the metabolic rate in afebrile tuberculous adults, which they have variously explained on the basis of: "*Kampf zwischen Organismus und Infektion*," [11] "oxygen deficiency in the nervous centers," [12] "stimulation of adrenal tissue

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11. Lanz: Deutsches Arch. f. klin. Med. **56**:619, 1896.
12. Brieger, E.: Beitr. z. Klin. d. Tuberk. **43**:403, 1926.

which in turn stimulates the thyroid gland" [13] and "an indication of a healing tendency." [14] In general, however, the basal metabolism of adults with active afebrile tuberculosis has been found to be essentially normal in a great majority of cases studied.

Studies of the basal metabolism of tuberculous children are few. We found reports of only two such studies in the literature. The more extensive of these was from Italy, where Cisi [15] made a study of 49 cases. He found an abnormally high basal metabolic rate in 40 per cent of patients studied. Unfortunately, he did not group his cases clinically; furthermore, he averaged the results of several tests made on the same child even though the tests were made at intervals of many months, during which time the entire character of the disease may have changed. The other study reported was from Vienna, where Helmreich [16] found a high basal metabolic rate after high caloric feeding in most of the tuberculous children studied. He expressed the belief that this increase in metabolism (*Plethypyrose*) is a necessary factor in healing and therefore has a definite prognostic significance.

During the past two years we have had an unsual opportunity to study the basal metabolism of tuberculous children in almost every phase of the infection. We have divided our patients into two groups: (1) those with afebrile pulmonary tuberculosis and (2) those with afebrile extrapulmonary tuberculosis. There were 40 patients in the second group. Of these 21 had a high basal metabolic rate and 19 a normal rate. It seemed to us that the patients with normal metabolism were those in whom fusion of the spine or hip had been performed several years previously and in whom no signs of tuberculous activity were present at the time of examination. The patients with a high metabolic rate seemed to be those with active tuberculosis of the bones, with draining sinuses or those with tuberculous adenitis or cold abscesses. However, the group was too small and not carefully enough studied to warrant any conclusions.

In this paper we are concerned only with the patients with pulmonary tuberculosis. These were separated into three groups: (1) those with primary tuberculosis, the so-called childhood type, with involvement of regional lymph nodes; (2) those with reinfection (superinfection), the so-called adult type of tuberculosis, and (3) those with pleurisy with effusion. In the last-mentioned there were 43 patients, of whom 26 had a high metabolic rate and 17 a normal rate. We realize that the

13. McBrayer, R. A.: Blood Sugar and Basal Metabolic Findings in Chronic Pulmonary Tuberculosis and Hyperthyroidism, J. A. M. A. **77**:861 (Sept. 10) 1921.
14. Kapp, H.: Beitr. z. Klin. d. Tuberk. **48**:378, 1928.
15. Cisi, C.: Riv. di clin. pediat. **23**:433, 1925.
16. Helmreich, E.: Klin. Wchnschr. **5**:466, 1926.

TABLE 1.—*Basal Metabolism of Children with the Adult Type of Tuberculosis*

Case No.	Age, Years	Height, Cm.	Weight, Kg.	Sitting Height, Cm.	Total Heat Production, 24 Hours		
					Calories Observed	Calories Predicted (Pirquet)	Percentage of Deviation
				Boys			
1	10	132	25	69	1,030	952	+ 7
2	12	146	50	80	1,313	1,280	+ 2
3	14	162	39	81	1,290	1,312	— 2
4	14	149	34	77	1,248	1,186	+ 5
5	15	159	54	85	1,524	1,445	+ 5
6	13	146	38	77	1,292	1,186	+ 9
7	14	147	34	77	1,258	1,186	+ 6
8	15	155	53	83	1,460	1,378	+ 6
9	12	142	40	76	1,205	1,155	+ 4
10	15	163	45	83	1,499	1,378	+ 9
11	13	159	46	84	1,542	1,411	+ 5
12	15	154	48	82	1,460	1,345	+ 8
13	16	156	50	84	1,246	1,411	—12
14	14	154	48	83	1,248	1,378	— 9
15	13	147	30	74	1,104	1,095	+ 1
16	13	157	45	79	1,361	1,248	+ 9
17	14	151	37	77	1,248	1,186	+ 5
18	15	158	48	86	1,675	1,479	+13
19	16	160	54	88	1,639	1,549	+ 6
20	13	152	45	80	1,264	1,280	— 1
21	15	164	50	89	1,330	1,584	—16
22	14	152	44	81	1,334	1,296	+ 3
23	15	154	45	84	1,538	1,411	+ 9
24	11	145	33	77	1,279	1,186	+ 8
25	10	132	26	68	925	900	— 2
26	12	135	28	70	1,135	980	+15
27	10	132	27	70	1,051	980	+ 7
28	15	159	55	82	1,490	1,345	+10
29	11	135	30	72	1,135	1,037	+ 9
30	10	134	27	70	1,051	980	+ 7
31	11	137	27	71	954	898	+ 6
				Girls			
1	15	161	50	83	1,542	1,378	+12
2	14	152	49	84	1,586	1,411	+12
3	15	152	38	84	1,422	1,411	+ 1
4	14	167	64	87	1,677	1,516	+11
5	8	133	34	73	1,044	1,066	— 2
6	13	150	41	77	1,296	1,186	+ 9
7	15	152	41	80	1,234	1,280	— 3
8	14	149	53	81	1,456	1,312	+11
9	15	150	54	83	1,464	1,378	+ 6
10	15	150	55	83	1,356	1,378	— 1
11	12	152	38	77	1,205	1,186	+ 2
12	13	153	48	80	1,318	1,280	+ 3
13	14	159	62	87	1,529	1,514	+ 1
14	15	150	52	80	1,258	1,280	— 2
15	14	158	52	83	1,499	1,378	+ 8
16	14	156	37	85	1,109	1,445	—13
17	15	157	37	86	1,388	1,479	— 6
18	15	155	34	80	1,292	1,280	+ 1
19	8	117	20	65	933	845	+10
20	15	158	58	82	1,449	1,411	+ 3
21	16	158	61	85	1,368	1,445	— 5
22	13	143	50	80	1,205	1,280	— 6
23	15	151	50	81	1,321	1,312	+ 1
24	13	159	51	81	1,460	1,312	+11
25	14	162	60	83	1,435	1,378	+ 4
26	11	135	28	70	1,135	980	+15
27	13	145	34	75	1,108	1,125	— 2
28	16	155	40	84	1,321	1,411	— 7
29	13	154	46	84	1,460	1,411	+ 3
30	15	146	35	77	1,292	1,186	+ 9
31	11	144	36	79	1,321	1,248	+ 6
32	13	145	47	81	1,388	1,312	+ 6
33	14	153	50	82	1,542	1,345	+14
34	14	154	50	82	1,548	1,345	+15
35	15	155	48	82	1,460	1,345	+ 8
36	15	150	46	86	1,274	1,496	—14
37	15	156	60	83	1,494	1,378	+ 8
38	16	158	60	85	1,452	1,428	+ 2
39	13	154	38	79	1,440	1,248	+15
40	16	160	49	88	1,320	1,549	—17
41	14	151	42	79	1,320	1,248	+ 5
42	14	154	50	82	1,548	1,345	+15
43	15	155	54	83	1,272	1,378	— 8

TABLE 1.—*Basal Metabolism of Children with the Adult Type of Tuberculosis—Continued*

Girls Continued

Case No.	Age, Years	Height, Cm.	Weight, Kg.	Sitting Height, Cm.	Total Heat Production, 24 Hours		
					Calories Observed	Calories Predicted (Pirquet)	Percentage of Deviation
44	16	156	40	81	1,316	1,328	— 1
45	14	170	45	90	1,361	1,620	—16
46	15	172	50	92	1,502	1,683	—11
47	8	131	25	69	990	938	+ 5
48	10	140	33	77	1,176	1,186	— 1
49	12	146	31	77	1,116	1,186	— 7
50	14	150	49	80	1,335	1,280	+ 4
51	15	155	50	82	1,411	1,345	+ 5
52	14	154	53	81	1,296	1,328	— 3
53	15	160	49	83	1,424	1,378	+ 3
54	8	119	25	63	902	744	+13
55	14	154	49	83	1,270	1,378	— 9
56	14	167	57	89	1,462	1,602	—10
57	14	159	60	84	1,434	1,411	+ 2
58	15	166	60	85.5	1,531	1,462	+ 4
59	14	146	45	77	1,287	1,186	+ 9
60	13	157	42	80	1,263	1,280	— 1
61	11	148	32	77	1,234	1,186	+ 4
62	13	158	43	82	1,364	1,345	+ 1
63	15	151	44	80	1,103	1,280	—13
64	15	158	48	85	1,248	1,428	—12
65	15	155	65	88	1,649	1,549	+ 6
66	14	146	34	81	1,322	1,312	+ 1
67	12	141	40	77	1,257	1,186	+ 6
68	14	158	50	80	1,467	1,280	+15
69	15	152	47	82	1,280	1,345	— 5
70	15	159	65	84	1,546	1,411	+10
71	10	127	25	68	1,012	925	+10
72	14	152	52	81	1,445	1,312	+10
73	16	164	58	84	1,464	1,411	+ 4
74	10	144	40	75.5	1,277	1,140	+12
75	14	166	53	89	1,577	1,584	— 1
76	16	168	54	84	1,289	1,411	— 8
77	15	146	46	78	1,226	1,217	+ 1
78	9	133	24	69	918	952	— 3
79	13	154	48	79	1,185	1,248	— 5
80	14	160	43	83	1,157	1,377	— 8
81	14	150	38	79	1,212	1,248	— 3
82	13	158	48	79	1,173	1,248	— 6
83	11	135	33	70	992	980	+ 2
84	9	135	27	69	918	932	— 3

pleural reaction may be present in a primary infection or in the superinfection type of tuberculosis; and until these cases have been studied over a sufficiently long period to determine the underlying pathologic process we prefer simply to mention them in this paper, without discussing the results.

In this report we shall confine our discussion to the first two groups mentioned: (1) children with primary tuberculosis and (2) children with the adult type of tuberculosis. We have carefully studied these two groups. Both comprise a sufficient number of patients to be significant, and certain striking results are worthy of report.

OBSERVATIONS

We studied the basal metabolism of 115 children with the adult type of tuberculosis. All of them were afebrile but had an active tuberculous process, diagnosed clinically and roentgenologically. These children fell, for the most part, into the higher age categories. This is consistent with the fact that when the adult type of tuberculosis occurs in childhood it

is seldom found before puberty. There were 84 girls and 31 boys. The fact that puberty is attained by girls at an earlier age explains the distribution on the basis of sex. By the time the process occurs in boys they are old enough to be admitted to the adult service instead of the pediatric service, from which all our patients were drawn. Of these 115 patients, 14 had a basal metabolic rate above plus 10 per cent; 9, below minus 10 per cent, and 92, or 80 per cent, within the normal zone of plus and minus 10 per cent (chart 1). These figures were predicted from the Pirquet standard based on sitting height.[17] The majority of children with the adult type of tuberculous infection had a normal basal metabolic rate, in which respect they resembled tuberculous adults with the same type of infection.

In those patients in whom pneumothorax had been instituted, there seemed to be a tendency toward a lowering of the basal metabolic rate.

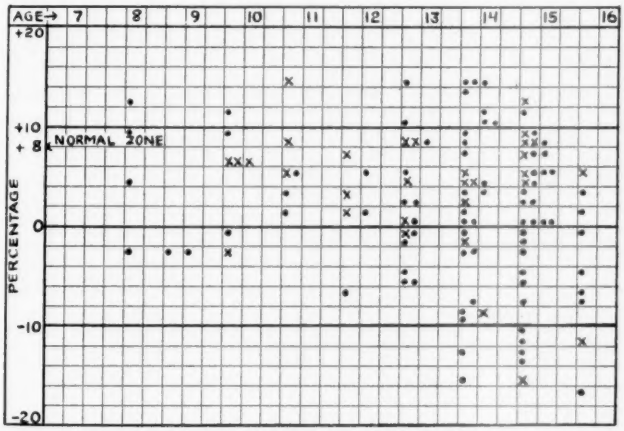

Chart. 1—Basal metabolic rates for children with the adult type of tuberculosis, based on sitting height (Pirquet). The crosses indicate values for boys; the dots, values for girls.

In 44 such patients studied to date, the basal metabolic rate ranged from plus 12 per cent to minus 17 per cent, the majority of values, however, falling in the minus range. In the patients in whom pneumothorax had been recently instituted, there was little or no lowering of the metabolism, but for the patients with long-standing pneumothorax, most of the figures were in the minus zone. It is known that the vital capacity of such children is lowered; that there is a decrease in the activity of the lungs, with a lessening of the spread of toxins due to the immobilization of the diseased lung, which is reflected in a lowering of the total metabolism.

17. von Pirquet, C.: An Outline of the Pirquet System of Nutrition, Philadelphia, W. B. Saunders Company, 1922.

In the group with primary tuberculosis, there were 191 children. Dr. Schick [18] pointed out that one must distinguish between tuberculous infection and tuberculous disease. About 95 per cent of Viennese children under 14 years of age are infected with tuberculosis, as evidenced by a positive cutaneous reaction; but under favorable conditions only a small percentage show evidence of disease. Likewise, under favorable conditions, lesions in children with active tuberculosis heal by scar formation and calcification takes place. The infection is arrested, becomes inactive, or may heal, and roentgen examination later establishes the diagnosis of the primary infection. Of course, we realize that even after calcification has taken place living tubercle bacilli may be present within the gland, as has been proved by guinea-pig inoculation; but the growing immunity of the organism may nullify the activity of the bacilli. Therefore, we separated our patients with primary tuberculosis into two subdivisions: 143 with signs of active tuberculosis and 48 with inactive tuberculosis. Of the latter patients, some had been sent to the Sea View Hospital because of a positive reaction to tuberculin and here were found to have no lesions discoverable clinically or roentgenologically. Others had been at the hospital for a long time with active disease but were ready for discharge, as they showed no clinical signs of tuberculous activity and roentgen studies revealed calcification of the primary process. Of these 48 patients with inactive tuberculosis, all but 8 had a normal basal metabolic rate.

The larger and more interesting group comprised 143 children with active, afebrile primary tuberculosis. Their ages ranged from 5 to 15 years, with the younger ages predominating. Of these children, 6, or 4.2 per cent, had a basal metabolic rate within the normal zone. The rest, 95.8 per cent, had a basal metabolic rate above plus 10 per cent (chart 2). It should be emphasized that these figures are actually basal. Dr. Rosenberg, who did most of the metabolism tests,[18a] was impressed with the results, and made repeated tests under strictly basal conditions until he was convinced that the figures were truly basal.

Because our results were so high, we compared them with those obtained by using another standard. Talbot [19] stated the belief that for growing children below the age of puberty the standard based on total height is best. As the majority of the children fell into the younger age groups, we used the standard based on height instead of that based on surface area. By this standard, only 8.4 per cent of the patients had a basal metabolic rate within the normal zone of plus and minus

18. Schick, Béla: M. Clin. North America **12**:561, 1928.

18a. Dr. Abraham Cowen did the tests for four months; Dr. Rosenberg did them during the rest of the period of study.

19. Talbot, F. B.: Physiol. Rev. **5**:477, 1925.

TABLE 2.—*Basal Metabolism of Children with the Childhood Type of Tuberculosis* *

Case No.	Age, Years	Height, Cm.	Weight, Kg.	Sitting Height, Cm.	Boys — Total Heat Production, 24 Hours: Calories Observed	Calories Predicted (Pirquet)	Percentage of Deviation	Calories Predicted (Benedict & Talbot)*	Percentage of Deviation
1	13	153	40	78	1,490	1,248	+19	1,316	+13
2	6	111	25	63	1,037	794	+30	840	+24
3	10	140	31	75	1,382	1,125	+22	1,165	+19
4	10	140	31	75	1,314	1,125	+17	1,165	+14
5	9	125	28	69	1,119	952	+17	990	+13
6	7	115	23	65	925	845	+10	875	+ 6
7	9	128	34	70	1,181	980	+20	1,025	+15
8	12	138	44	75	1,320	1,125	+17	1,140	+16
9	13	140	52	75	1,342	1,125	+19	1,165	+16
10	8	123	23	66	1,085	871	+24	965	+13
11	5	114	22	64	1,046	794	+32	865	+29
12	6	116	30	66	1,200	871	+38	885	+35
13	7	120	31	67	1,128	898	+26	935	+20
14	7	121	26	67	1,065	898	+19	945	+13
15	6	110	20	62	973	769	+27	835	+17
16	10	134	25	73	1,234	1,066	+15	1,090	+13
17	11	135	32	73	1,234	1,066	+15	1,105	+13
18	14	160	52	81	1,601	1,312	+22	1,400	+14
19	14	161	49	80	1,555	1,280	+21	1,400	+11
20	12	149	31	76	1,339	1,155	+16	1,268	+ 6
21	13	150	47	77	1,471	1,186	+24	1,280	+15
22	5	105	18	60	919	720	+28	805	+14
23	5	118	23	65	979	845	+15	915	+ 7
24	6	113	22	63	979	794	+23	858	+14
25	11	145	48	79	1,536	1,248	+23	1,220	+26
26	5	107	20	63	928	794	+18	815	+14
27	8	117	20	65	1,000	845	+18	900	+11
28	5	108	18	63	858	794	+ 8	820	+ 5
29	11	136	35	72	1,217	1,037	+17	1,115	+10
30	7	109	20	62	958	769	+24	827	+16
31	8	113	25	64	1,106	819	+35	858	+29
32	10	133	27	70	1,222	980	+25	1,083	+13
33	10	133	27	70	1,286	980	+34	1,083	+20
34	8	118	24	66	1,130	871	+29	915	+24
35	8	125	27	69	1,181	952	+23	990	+19
36	14	150	51	80	1,443	1,280	+13	1,280	+13
37	6	112	24	63	991	806	+23	850	+17
38	15	150	44	80	1,555	1,280	+21	1,280	+21
39	12	140	38	75.5	1,372	1,140	+20	1,165	+18
40	8	130	30	71.5	1,263	1,008	+24	1,045	+20
41	11	140	38	75	1,481	1,125	+30	1,165	+29
42	8	121	25	67	1,090	898	+21	945	+15
43	14	150	44	79.5	1,591	1,264	+26	1,280	+24
44	15	150	47	79.5	1,572	1,264	+20	1,280	+22
45	6	112	20	63	1,003	794	+26	850	+18
46	15	153	46	81	1,610	1,312	+22	1,316	+22
47	7	125	31	69	1,154	952	+21	990	+17
48	10	140	34	76	1,344	1,155	+16	1,165	+16
49	6	118	24	64	1,027	819	+25	915	+12
50	6	117	24	63	1,042	806	+29	900	+16
51	10	134	35	72	1,269	1,037	+22	1,090	+17
52	11	137	38	73	1,481	1,066	+39	1,130	+31
53	15	167	62	87	1,778	1,514	+17	1,500	+19
54	6	118	21	65	1,068	832	+28	915	+17
55	8	118	22	65	977	845	+15	915	+ 7
56	6	115	24	64	1,061	818	+29	875	+21
57	6	121	24	66	1,188	871	+36	945	+26
58	6	112	24	64	1,138	818	+39	850	+34
59	13	145	39	77	1,365	1,140	+20	1,220	+12
60	6	114	23	63	1,030	794	+30	865	+20
61	9	129	29	70	1,164	980	+18	1,035	+12
62	5	112	22	64	1,075	819	+31	850	+26
63	6	114	23	63	1,015	794	+28	865	+17
64	6	115	22	65	1,008	845	+20	875	+15
65	14	152	50	80	1,659	1,280	+29	1,304	+27
66	11	132	37	72	1,188	1,037	+14	1,072	+11
67	11	132	34	72	1,092	1,037	+ 5	1,072	+ 2
68	9	125	28	69	1,119	952	+17	990	+13
69	7	122	25	67	1,076	898	+19	955	+13

TABLE 2.—*Basal Metabolism of Children with the Childhood Type of Tuberculosis* *—*Continued*

Case No.	Age, Years	Height, Cm.	Weight, Kg.	Sitting Height, Cm.	Girls — Total Heat Production, 24 Hours — Calories Observed	Calories Predicted (Pirquet)	Percentage of Deviation	Calories Predicted (Benedict & Talbot)*	Percentage of Deviation
1	8	125	25	67	1,076	898	+20	915	+17
2	8	119	25	65	1,037	845	+24	857	+21
3	10	139	40	74	1,339	1,095	+22	1,048	+27
4	6	116	28	64	1,138	819	+39	823	+37
5	6	117	23	65	1,071	845	+27	837	+29
6	7	117	23	64	1,051	819	+28	837	+25
7	10	142	40	74	1,310	1,095	+20	1,090	+20
8	10	130	31	68	1,071	925	+15	965	+11
9	5	102	18	57	745	650	+14	695	+ 6
10	6	118	23	63	907	793	+16	847	+ 7
11	10	135	30	70	1,123	980	+14	1,016	+ 2
12	6	112	30	61	973	744	+33	788	+23
13	7	114	21	60	972	720	+35	807	+20
14	7	115	21	61	988	744	+32	817	+21
15	9	120	32	65	1,135	845	+35	866	+31
16	8	121	25	66	1,120	871	+28	875	+28
17	10	130	30	69	1,138	952	+19	965	+18
18	9	123	26	66	1,179	871	+35	894	+32
19	11	138	28	71	1,297	1,008	+28	1,047	+24
20	6	122	23	64	990	819	+21	855	+16
21	11	140	34	73	1,258	1,066	+18	1,067	+18
22	8	127	25	67	1,157	898	+29	935	+24
23	9	128	25	68	1,046	925	+13	945	+17
24	9	130	20	68	1,157	925	+25	965	+20
25	10	133	22	70	1,113	980	+14	995	+11
26	6	111	20	60	988	720	+37	778	+27
27	7	112	20	60	1,007	720	+39	788	+29
28	8	117	21	63	936	794	+18	837	+12
29	5	109	20	60	868	720	+20	759	+15
30	5	108	17	60	841	720	+20	749	+13
31	5	106	18	58	815	673	+21	730	+12
32	5	107	21	61	892	732	+22	740	+25
33	14	152	54	79	1,542	1,248	+24	1,200	+28
34	15	153	56	80	1,464	1,280	+14	1,215	+20
35	9	127	20	68	1,080	925	+17	935	+15
36	15	157	45	81	1,512	1,312	+15	1,260	+20
37	13	151	52	80	1,542	1,280	+21	1,260	+20
38	9	128	25	68	1,085	925	+15	945	+15
39	15	154	52	81	1,629	1,312	+24	1,230	+25
40	9	128	33	69	1,114	952	+17	945	+14
41	7	114	21	62	972	769	+26	807	+20
42	7	114	18	62	1,000	769	+30	807	+25
43	7	119	24	63	994	794	+24	857	+16
44	9	119	21	64	908	819	+10	857	+ 6
45	9	121	23	64	1,075	819	+31	875	+23
46	5	100	17	58	864	661	+28	675	+28
47	9	140	34	75	1,435	1,125	+27	1,070	+33
48	6	100	19	60	948	720	+32	675	+40
49	9	131	46	71	1,290	1,008	+28	975	+32
50	9	123	25	66	1,179	871	+35	894	+32
51	7	120	33	65	1,135	832	+36	866	+31
52	9	131	46	71	1,290	1,008	+28	975	+32
53	13	158	50	78	1,421	1,216	+17	1,270	+12
54	6	100	20	59	886	696	+27	675	+31
55	10	145	38	76	1,365	1,155	+19	1,120	+22
56	8	121	38	65	1,135	832	+34	875	+30
57	6	115	24	64	1,034	819	+26	817	+26
58	6	117	23	65	1,071	845	+27	837	+27
59	10	134	33	70	1,315	980	+39	1,005	+30
60	10	145	39	76	1,372	1,155	+19	1,150	+19
61	9	111	21	60	981	732	+34	778	+29
62	5	110	19	60	994	720	+31	769	+29
63	6	113	23	61	1,044	744	+36	797	+31
64	7	120	26	66	962	871	+10	894	+11
65	10	144	39	76	1,306	1,155	+13	1,140	+16
66	6	109	16	59	842	696	+20	759	+11
67	10	147	37	77	1,363	1,140	+20	1,160	+17
68	6	113	23	61	984	744	+29	797	+24
69	7	120	34	65	1,060	845	+25	866	+22
70	8	130	34	68	1,046	935	+13	965	+ 8
71	9	136	45	74	1,280	1,095	+17	1,026	+24
72	5	104	19	60	797	720	+10	711	+12
73	8	118	48	65	1,028	845	+21	847	+21
74	5	115	20	63	1,008	794	+27	817	+23

* Beyond 138 cm. for girls and 150 cm. for boys, all figures are projected according to the Benedict & Talbot prediction standard.

10 per cent; the rest, 91.6 per cent, had a rate above plus 10 per cent (chart 3). Many of these children are being studied at intervals during their stay at the Sea View Hospital. We have found that as long as there are signs of active infection the basal metabolic rate remains high. As the process becomes inactive, there is a decrease in the rate of metabolism, with a subsequent return to normal when the child is ready for discharge. We expect to report later a study of such cases, with the results of serial physical and roentgen examinations, basal metabolism tests, blood counts and determinations of the sedimentation rates, to show that the basal metabolic rate parallels other findings and is indeed a sensitive and reliable index of the activity of a tuberculous

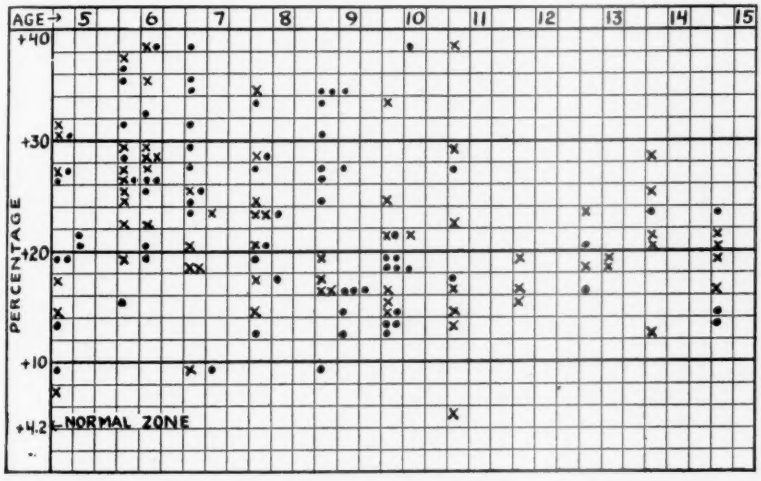

Chart 2.—Basal metabolic rates for children with the childhood type of tuberculosis, based on sitting height (Pirquet). The crosses indicate values for boys; the dots, values for girls.

lesion of the childhood type. This fact has been so striking that we are using the basal metabolic rate as an additional criterion of readiness for discharge from the hospital.

COMMENT

Our studies show that in active tuberculosis of the childhood type the basal metabolism is increased above the normal limit, even in the absence of fever. How shall we explain such an increase? It is known that the basal metabolism may be increased by fever, by hyperactivity of the thyroid gland, by toxic destruction of protein, by puberty and by certain blood dyscrasias. We could discover none of these causes

in our cases. The children were all afebrile at the time of testing and remained so for weeks or months during the period of observation. None of them manifested signs of hyperthyroidism. However, in order to exclude the possibility of hyperactivity of the thyroid gland, we gave small doses of iodine to a few who showed an increase in metabolism. The importance of compound solution of iodine U.S.P. in cases of hyperthyroidism was established in 1923 by Plummer.[20] The rapid fall in metabolism that follows its use in all but about 5 per cent of cases is now well known. If the increase in basal metabolic rate in these patients was an indication of an increase in the activity of the thyroid, as it is in exophthalmic goiter, the drug should have effected a lowering of the metabolic rate. In 15 patients to whom as much as 10 drops of the

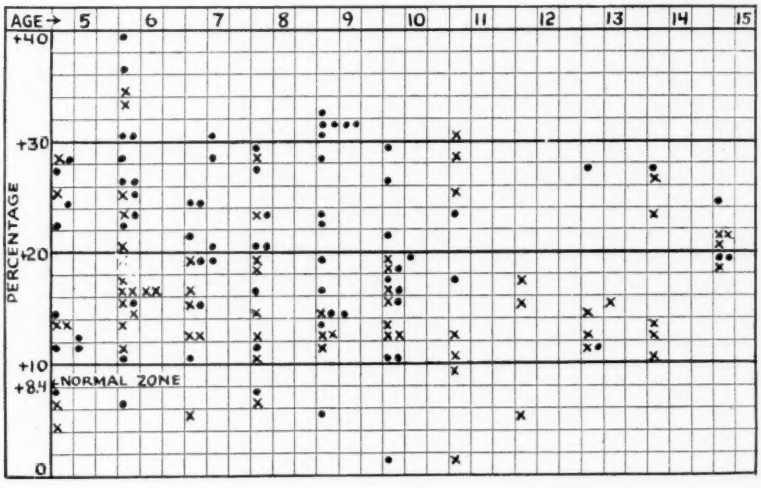

Chart 3.—Basal metabolic rates for children with the childhood type of tuberculosis, based on total height (Benedict and Talbot). The crosses indicate values for boys; the dots, values for girls.

solution was given daily for ten days, no appreciable decrease in the rate was noted. In 4 patients there was a slight fall, which remained, however, well within the limits of normal fluctuation.

A hypothesis of an unusually great destruction of protein can be denied on the basis that these children were afebrile and atoxic and for the most part were gaining in weight—an accomplishment manifestly impossible in the face of great loss of protein.

Puberty as a factor in the increase of metabolism can also be excluded here since, as we have pointed out, most of the children were

20. Plummer, H. B., in Christian, H. A., and Mackenzie, J.: Oxford Medicine, New York, Oxford University Press, 1923, vol. 3, p. 831.

in the younger age groups and, paradoxically, the group with the adult type of tuberculosis, although nearer the age of puberty, had normal metabolic rates, for the most part.

Blood dyscrasia as a contributing cause for the increase in metabolism can likewise be excluded.

It is known that it is possible to have an increase in metabolism as a result of infection, even in the absence of fever. In the prodromal stage of measles and varicella, the metabolic rate may increase even before fever develops.[21] In afebrile sepsis lenta Gessler [22] found an increase in the metabolic rate. In patients with syphilis treated with injections of the malaria organism,[23] a rise in the basal metabolic rate may occur before a rise in temperature. Similarly, rabbits inoculated with tubercle bacilli from infected guinea-pigs show an increase in metabolism before they have fever. We have several times seen an apparently inexplicable rise in the basal metabolism precede by twelve hours an attack of acute tonsillitis with fever in an otherwise normal child. The presence of active infection alone may, therefore, be associated with an increase in the basal metabolism.

However, all these factors fail to explain the fact that the increase in metabolism was found only in those children with the childhood type of infection, while those with the adult type of tuberculosis had normal metabolism. We believe that the explanation must be sought in the pathologic and immunologic differences inherent in the two types of infection.

When streptococci are injected into normal rabbits positive cultures of streptococci are obtained from lymph nodes, the blood and the spleen, while after similar injections into sensitized rabbits the organisms are obtained only from the local site of the injection.[24] Similarly, the child with symptoms of active childhood tuberculosis differs in his reactivity toward the tubercle bacillus from the child who has never been exposed. His sensitiveness also differs from that of the person who is reinfected later in life. The childhood type of tuberculous infection shows a predilection for lymphatic tissue. There is a general reaction, with intensive reactivity of the lymphatic system. The adult type of tuberculosis shows a more localized reactivity. It is interesting to note that in other hyperergic diseases sensitiveness may start in one organ, for example the skin, as the shock organ (eczema) and be transferred later

21. Birk, quoted by Strieck and Wilson.[23]

22. Gessler, H.: Deutsches Arch. f. klin. Med. **144**:188, 1924.

23. Strieck, F., and Wilson, H. E. C.: Deutsches Arch. f. klin. Med. **157**: 173, 1927.

24. Angevine, D. M.: J. Exper. Med. **60**:269, 1934.

to the respiratory tract (asthma) or some other shock organ. In case of tuberculous infection of the childhood type, lymphatic tissue responds more intensively. In the adult type of infection, the "battle ground is shifted from the lymphatics to other sensitized tissue cells."[25] Two questions arise: 1. Is the dynamic power of lymphatic tissue greater than that of other cellular tissue? 2. Is the intensity of reactivity greater during the childhood type of infection than during the adult type? Do these factors account for the increase in basal metabolism found in the childhood type of tuberculosis?

We know that in diseases of the lymphatic system, notably leukemia, a high basal metabolism is found even in the absence of fever. The lymphocyte has long been of interest to the cytologist, and there is a surprising uniformity of opinion to the effect that this cell possesses some specific property which plays a part in the reaction of the host to tuberculous infection. One of us[26] observed that in conditions associated with splenomegaly (part of the reticulo-endothelial system) there is often an increase in the basal metabolic rate.[26] Differences in the intensity of allergic reactivity are known to exist in different children and also between children and adults. As a rule, the intensity of all reactions of the skin to tuberculin is less marked in adults. Frisch[27] noted after subcutaneous tuberculin tests an increase in basal metabolic rate, even in the absence of fever, which lasted twenty-four hours in some cases and longer in others.

These are the facts that we wish to emphasize: Children with an active childhood type of tuberculosis have an increase in basal metabolism even in the absence of fever, while children with an active adult type of tuberculosis have a normal metabolism.

SUMMARY AND CONCLUSIONS

A study of the basal metabolism of tuberculous children was made at the Sea View Hospital. The data are shown in tables 1 and 2. The outstanding results of this study are as follows:

Of 115 patients with active, afebrile pulmonary tuberculosis of the adult type, 80 per cent had a normal basal metabolic rate predicted from the Pirquet standard (chart 1).

Of 143 patients with active, afebrile pulmonary tuberculosis of the childhood type, only 4.2 per cent had a normal metabolic rate. The rest, 95.8 per cent, had an increase in the basal metabolic rate (between plus 10 and plus 40 per cent) predicted from the Pirquet standard (chart 2).

25. Pottenger, F. M.: Am. Rev. Tuberc. **16**:345, 1927.
26. Topper, A.: Acta pædiat. **16**:189, 1933.
27. Frisch, A. V.: Beitr. z. Klin. d. Tuberk. **46**:550, 1927.

Because these figures were so high we compared the results with the standard of Benedict and Talbot, based on total height. Here again the great majority of patients, 91.6 per cent, had an increase in the basal metabolic rate (chart 3).

Reasons for this difference in metabolic response between patients with tuberculosis of the childhood type and patients with tuberculosis of the adult type are still theoretical, but the cause probably lies in the pathologic and immunologic differences inherent in the two types of infection.

PROGNOSIS OF RHEUMATIC INFECTION IN CHILDHOOD

A STATISTICAL STUDY

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That the incidence and clinical characteristics of rheumatic fever may vary in different parts of the world and in different parts of the United States is indicated by statistical reports.[1] It has been stated that data bearing on the complications and prognosis in one region may not necessarily apply in more distant points.

In order to obtain information concerning rheumatic fever as it manifests itself among the patients of the Children's Hospital, a study has been made of the records of all rheumatic patients treated in the wards or in the clinic for patients with heart disease during the period from 1922 to 1932, inclusive. This group presents a cross-section of rheumatic infection in childhood, since it includes children with fulminating types resulting in death early in the first attack and children admitted to the wards with rheumatic fever or chorea and supervised subsequently by their private physicians or at the clinic, as well as children with milder forms of the disease treated as ambulant patients through the clinic.

Since the establishment of this clinic at the Children's Hospital in 1922, many children in this series have been under continuous observation. Among the ward patients there have been numerous readmissions. From 1933 to 1935 an attempt was made to trace and bring back for examination all children not under current observation. To fill in gaps in the records information was obtained from other clinics for patients with heart disease and other hospitals in Philadelphia and from private physicians, relatives and friends.

The present paper is an analysis of the incidence and prognosis with regard to various clinical factors in this group of patients. The difficulties of diagnosis of a disease of which the etiologic agent is unknown and for which there is no specific test are obvious. Of a total of 528 patients admitted with a diagnosis of rheumatic fever, rheumatic endocarditis or chorea, 445 were accepted as probably having rheumatic

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From the Department of Pediatrics of the School of Medicine, the University of Pennsylvania, and the Children's Hospital.

1. Paul, J. R.: The Epidemiology of Rheumatic Fever, New York, American Heart Association, 1930.

infection. By 1935 401 (90.2 per cent) of these children had been traced. Fifteen of the children not located had been under observation for varying periods, so that the course of the disease is known for two or more years (average duration, seven and one-half years) in 416 cases (93.4 per cent).

Of the total group traced (table 1), 93 (22.3 per cent) died as a result of rheumatic infection. Included among these were 5 children with terminal subacute endocarditis due to Streptococcus viridans. Four children (0.9 per cent) died of other causes. Valvular heart disease was present in 275 (66.1 per cent). Murmurs, possibly of nonorganic origin, were present in 23 (5.5 per cent). There was no apparent valvular involvement in 118 (28.2 per cent). The criteria used for the diagnosis of heart disease were those advocated by the American Heart Association.[2]

TABLE 1.—*Prognosis of Rheumatic Infection During a Ten Year Period*

Author	Period	Total Number of Patients	Patients Traced		Average Age at Onset, Years	Average Duration of Infection, Years	Deaths, Percentage	Valvular Heart Disease, Percentage
			Number	Percentage				
Present series								
Total	1922-1932	445	416	93.4	6.8	7.5	22.3	66.1
Patients in heart clinic	.....	...	218	....	...	...	12.4	66.6
Patients in ward	.....	...	198	....	...	...	33.3	66.0
Jones and Bland, Boston, 1935	1921-1932	1,000	...	....	...	8.0	21.7	70.6
Kaiser, Rochester, N. Y., 1934	.....	1,240	564	45.4	...	5.8	8.2	64.0
Stroud, Philadelphia, 1933	1922-1931	458	307	64.8	7.3	...	31.9	....
Findlay, Glasgow, 1931	1920-1929	...	561	....	±7.0	5+	19.9	60.9
Wilson et al, New York, 1927	1916-1927	416	355	85.6	7.3	...	10.8	79.5

INITIAL INFECTION

In 257 patients (57.7 per cent) the disease began with fever of varying degree associated with migratory articular pains of varying intensity. It is of interest that though many of these children were observed during a period when articular pain existed, often with objective evidence of swelling and tenderness, a large percentage, even within a few years of their illness, had no memory of such pains. One can readily understand the difficulty of obtaining an early history of rheumatism when heart disease is first detected in adult life.

In 74 instances (16.6 per cent) carditis was the first symptom: acute in 21 cases, insidious in 53. In 8 of the cases of acute involvement there was associated pneumonitis. Growing pains at the time of onset were

2. Criteria for the Classification and Diagnosis of Heart Disease, New York, American Heart Association, 1932.

noted in 17 instances (3.8 per cent). Chorea was the first manifestation of the disease in 97 cases (21.3 per cent).

AGE AND DURATION

The average age at which these children came under observation was 7.6 years (chart 1). The age at which the first rheumatic manifestation appeared varied from 21 months to 11 years, the average age at the time of onset in the whole series being 6.8 years. With chorea as the first manifestation, the average age at the time of onset was extended to 7.8 years.

The age at the last time of observation varied from 5 to 23 years, the average age in the entire group being 14 years. From two to nine-

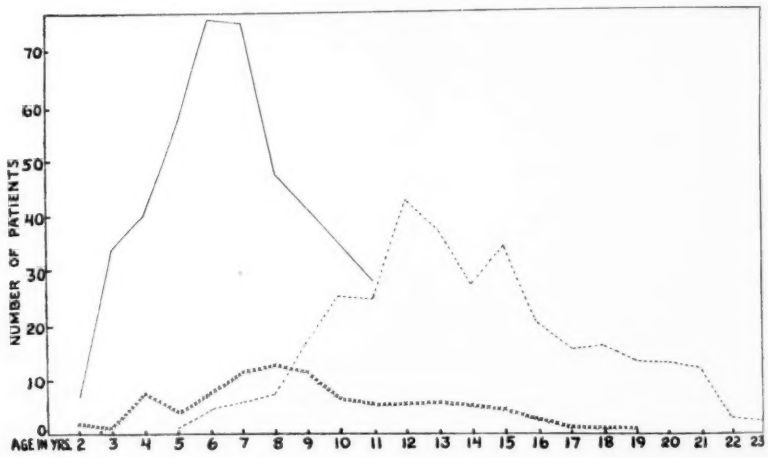

Chart 1.—Age distribution in 445 cases of rheumatic infection. The solid line indicates the age at the time of the onset of the infection; the dash line, the present age of the survivors; the crosses, the age at the time of death.

teen years had elapsed since the onset, the average duration being seven and one-half years.

ENVIRONMENT AND RACIAL SUSCEPTIBILITY

The Children's Hospital is situated in a section of Philadelphia populated largely by families of Italian descent and by Negroes. Eighty-three per cent of the rheumatic children in the present series were white and 17 per cent Negroes. Since the patients in the dispensary and wards of the hospital are as a rule equally divided between white and Negro children, there seemingly exists a racial resistance to rheumatic infection among Negro children. In a series reported from the Bellevue

Hospital [3] the percentage of Negro children in the general pediatric clinic was three times that in the clinic for patients with heart disease. At the Nursery and Child's Hospital in New York, in a clinic for patients with heart disease which drew from a Negro district, only 4.6 per cent of the children enrolled were Negroes.[4]

Both the Negro and the white children in the present group came, as a rule, from poor families, many of them destitute and dependent on public relief. It is recognized that rheumatic infection occurs most frequently among children in the poorer classes. Paul has recently found the incidence of rheumatic heart disease to be eight times as great in children attending a public school in a poverty-stricken district of New Haven as in children attending private schools. Moreover, the disease occurred twice as frequently in students of Yale University who came from high schools as in those who had attended expensive boarding schools.[5]

Though overcrowding, malnutrition and poverty may furnish a favorable soil for the development of rheumatic infection, the relative insusceptibility of Negro children indicates that these are not the sole contributing factors. There seems to be a special tendency to the development of rheumatic disease in certain families. In the present series there was a history of rheumatism in other members of the family in 16.6 per cent of the cases. A higher familial incidence has been noted by others.[6] In certain families simultaneous or successive attacks of rheumatism in different members strongly suggested an infection acquired simultaneously or from direct contact. In other families there was a history of rheumatism in different generations or in collateral branches without the possibility of contact.

Negro children in the group studied (table 2) showed no increased tendency to the development of rheumatic heart disease, but when cardiac involvement did occur there was a slightly greater tendency to the development of pancarditis terminating in early death. A higher

3. Sutton, L. P.: Observations on Certain Etiologic Factors in Rheumatism. Am. Heart J. **4**:145, 1928.

4. Wilson, M. G.; Lingg, C., and Croxford, G.: Statistical Studies Bearing on Problems in the Classification of Heart Disease: III. Heart Disease in Children, Am. Heart J. **4**:164, 1928.

5. Paul, J. R.; Harrison, E. R.; Salinger, R., and DeForest, G. K.: The Social Incidence of Rheumatic Heart Disease: A Statistical Study in New Haven School Children, Am. J. M. Sc. **188**:301, 1934. Paul, J. R., and Leddy, P. A.: The Social Incidence of Rheumatic Heart Disease: A Statistical Study in Yale University Students, ibid. **184**:597, 1932.

6. (*a*) St. Lawrence, W.: Family Association of Cardiac Disease, Acute Rheumatic Fever and Chorea: A Study of One Hundred Families, J. A. M. A. **79**:2051 (Dec. 16) 1922. (*b*) Findlay, L.: The Rheumatic Infection in Childhood, New York, William Wood & Company, 1932. (*c*) Wilson, Lingg and Croxford.[4]

percentage of Italian children showed rheumatic heart disease than the racial percentage of their group, but in a milder form resulting in fewer deaths, whereas among the relatively few Jewish children there was a disproportionately high death rate. Stroud's [7] series from the Children's Heart Hospital in Philadelphia also showed a higher death rate among the Jewish children and a lower death rate among the Italian children than would be expected from their relative proportions in the group.

SEX

In the group as a whole there were a few more girls than boys (boys, 43.2 per cent; girls, 56.8 per cent). This preponderance was exaggerated in the instances of chorea with no other rheumatic manifestations, the ratio of girls to boys being 2.5 : 1. There was a preponderance of girls with involvement restricted to the mitral valve (boys, 36.7 per cent; girls, 63.3 per cent), whereas there was a greater tendency among

TABLE 2.—*Prognosis According to Racial Group*

Racial Descent	Percentage of Total Group		Deaths, Percentage		Present Series	
	Present Series	Stroud	Present Series	Stroud	Heart Disease, Percentage	Pericarditis, Percentage
Italian	38.2	37.1	34.7	31.7	44.0	33.3
North European	33.2	33.9	28.2	34.1	26.0	31.3
Negro	17.0	....	20.6	....	16.7	21.6
Jewish	9.2	29.0	12.0	34.2	9.3	9.8
Slavic	2.4	....	4.3	....	2.7	3.9

boys to involvement of the aortic valve (boys, 60.7 per cent; girls, 39.2 per cent), of the pericardium (boys, 52.8 per cent; girls, 47.2 per cent) and of the lung (boys, 58 per cent; girls, 42 per cent). In general, although the disease was more prevalent among girls, its severest manifestations occurred more frequently among boys. The division of the sexes among those who died was similar to that of the group as a whole (boys, 44.4 per cent; girls, 55.6 per cent).

PROGNOSIS OF RHEUMATIC MANIFESTATIONS

Chorea.—In the diagnosis of chorea every effort was made to include only cases in which the condition was typical of the true Sydenham chorea.[8] Chorea occurred in 153 children (34.4 per cent) of the entire group. One hundred and thirty-eight (90.2 per cent) of these children

7. Stroud, W. D.; Goldsmith, M. A.; Polk, D. S., and Thorp, F. Q.: Ten Years' Observation of Children with Rheumatic Heart Disease, J. A. M. A. **101**:502 (Aug. 12) 1933.

8. Ash R., and Einhorn, N.: Use of Typhoid Vaccine in Treatment of Chorea: Its Possible Dangers, Am. J. Dis. Child. **50**:879 (Oct.) 1935.

were observed for a period of two years or longer, the average period being seven and one-half years. Of the group of children with chorea, 62.8 per cent at some time suffered from articular pains. In 24 instances (15.6 per cent of the children with chorea) the sequence of choreic movements and articular pains was so rapid as to make inevitable the assumption that both were manifestations of a single infection. In the group without articular pains, 6 children presented other rheumatic manifestations, such as pericardial friction rub and periods of slight fever with changing cardiac signs or nosebleed. Only 45 (29.4 per cent), therefore, had "pure chorea," as defined by Jones and Bland.[9] Not all these children were under continuous observation, and it is possible that mild manifestations other than chorea may have escaped notice by the parents.

Among those children with chorea who had never presented other manifestations of rheumatic infection, valvular heart disease occurred in 13.3 per cent and death of cardiac origin in 4.4 per cent, whereas the incidence of valvular heart disease in the group of rheumatic children with no history of chorea was 70 per cent and of deaths 25.5 per cent (chart 2). The benign significance of chorea is evidenced even more strikingly in the recent analysis by Jones and Bland [9] of the cases of 482 patients with chorea observed in Boston eight years from the time of onset. Rheumatic cardiac disease developed in 3 per cent of the 134 patients with pure chorea in their series, and only 1 death occurred, whereas rheumatic cardiac disease developed in 73 per cent of 348 patients with chorea and other manifestations of rheumatic fever and 14 per cent died. Among 518 patients with rheumatic fever only, Jones and Bland found an incidence of cardiac involvement of 86 per cent and a death rate of 32 per cent. In their paper these authors presented an excellent summary of the conflicting points of view as to the prognostic significance of chorea.

In my series the incidence of valvular heart disease was slightly greater in the group presenting symptoms of both chorea and articular pains (71.5 per cent as compared with 70 per cent in the group with pure rheumatism). In children with infection sufficiently generalized to present a variety of symptoms including both chorea and articular pains it is not surprising to find a high incidence of rheumatic heart disease. Yet the cardiac involvement in the group with a history both of chorea and of articular pains seemed to be of a milder type, for the death rate (17.5 per cent) was less than among those with a history of rheumatic infection but without chorea (25.5 per cent). A fatal

9. Jones, T. D., and Bland, E. F.: Clinical Significance of Chorea as a Manifestation of Rheumatic Fever: A Study in Prognosis, J. A. M. A. **105**:571 (Aug. 24) 1935.

outcome seems to be dependent on the severity of the rheumatic infection, regardless of the existence of chorea, which in itself may be considered a mild manifestation.

The low incidence of heart disease in children with pure chorea has been advanced as evidence to prove that chorea is not a rheumatic manifestation. I have seen children with rheumatic infection who suffered simultaneously from choreic movements, articular pains and active rheumatic heart disease. I doubt if any person has ever died of chorea alone without other evidence, perhaps unrecognized, of generalized rheumatic infection. But, although in such severe rheumatic infections all

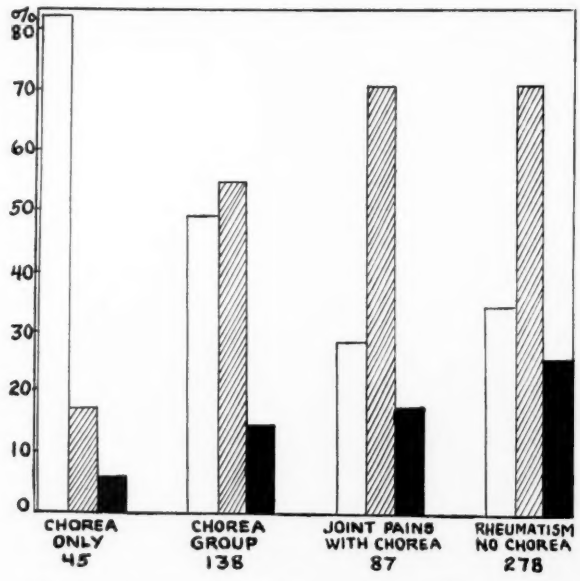

Chart 2.—Influence of chorea on the prognosis in rheumatic infection. The average duration since the onset was seven and one-half years. The white columns indicate the cases of potential heart disease (absence of clinically demonstrable heart disease in a patient who has had either rheumatic fever or chorea); the shaded columns, the cases of rheumatic heart disease, and the black columns, the fatal cases of cardiac disease.

possible mesenchymal structures, including the heart, may be involved, it does not follow that this need occur in all instances. An analogy may perhaps be drawn with syphilis and tuberculosis. Just as dementia paralytica need not necessarily be associated with syphilitic aortitis, so chorea need not always be associated with cardiac involvement. Some patients die of generalized miliary tuberculous infection, whereas many others have lesions restricted to a joint or to a few lymph nodes. Even

if the etiologic agent of rheumatism is not known, it may be assumed that its action can be modified by general or localized tissue immunity or susceptibility.

Pericarditis.—Acute pericarditis was observed in 51 instances (12.2 per cent; chart 3). It occurred one and one-half times as frequently in boys as in girls. Seventy-eight per cent of the group had already died, three-fifths of the deaths occurring within one year after the appearance of the pericardial friction rub. In 12 of the patients who died early pericarditis was merely one phase of a rapidly fatal pancarditis with which the disease originated, the average duration of life being four months. The remaining 18 children presented terminal pancarditis, which appeared from one to ten years after the onset of the rheumatic

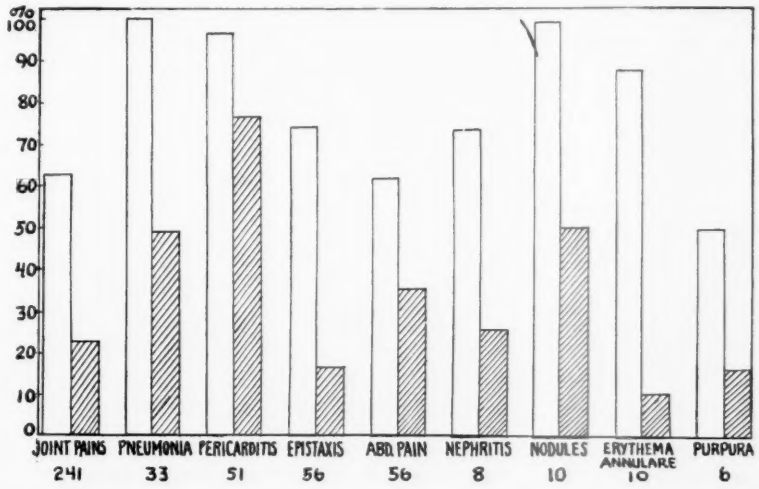

Chart 3.—Incidence of rheumatic heart disease and the mortality rate following the appearance of various clinical manifestation of the rheumatic state. The average duration since the onset of rheumatism was seven and one-half years. The white columns indicate the cases of rheumatic heart disease, and the shaded columns, the fatal cases of cardiac disease.

infection. In 10 children death from rheumatic heart disease occurred at periods varying from two to six years after recovery from acute pericarditis. Eleven children were still alive, an average period of five years having elapsed. The child who survived for the longest time lived eight years. One child presented no obvious evidence of cardiac damage five years after the initial attack. The others all had valvular heart disease. In 2 this resulted in a great limitation of activity and in 5 in a slight limitation of activity, in only 1 not being associated with a decrease in effort tolerance.

It is well to remember that a few patients after recovery from pericarditis may be able eventually to lead a normal existence and occasionally even to lose all signs of the previous infection, but on the whole the prognosis after acute pericardial involvement is poor. Of Findlay's [6b] series of 69 patients, 40 (63.4 per cent) were dead, of whom 33 had died during the acute attack and the other 7 from one to seven years later. All the 29 survivors had cardiac disease, and 15 presented symptoms of cardiac involvement. Holt [10] traced 43 of 51 children who had survived an acute attack of pericarditis and found that 21 had died within four years, 16 were in poor condition and only 6 were leading reasonably normal lives. Since pericarditis usually appears in association with a severe infection which simultaneously produces widespread involvement of the myocardium and as a rule of more than one valve, it is inevitable that the prognosis should be serious.

Valvular Damage.—Although the mortality from rheumatic cardiac disease is dependent on the existence of active rheumatic infection, it is probable that when more than one valve has been involved the infection has been correspondingly more severe. In the present series the death rate in 190 cases of mitral involvement was 30 per cent, whereas in 74 cases of mitral and aortic involvement it was 48.6 per cent.

The typical rumble of the adult type of mitral stenosis was heard in only 15 patients. Forty-seven per cent of this group had died, so that the early appearance of a button-hole stenosis may be considered of fairly ominous significance.

Pneumonia.—Signs in the lungs interpreted as due to so-called pneumonia of rheumatic origin were noted in 33 patients (7.6 per cent), of whom 58 per cent were boys. Changes at the base of the left lung associated with cardiac dilatation or with pericardial effusion were not included in this group. Eight children presenting pneumonia at the onset associated with acute pancarditis resembled the patients described by Boas and Schwartz [11] in whom an attack of rheumatic fever was ushered in by bronchopneumonia, making it impossible to determine when the pneumonia ceased and the rheumatism began. One of the patients in my series came to necropsy, and the lungs presented the interstitial cellular proliferation characteristic of rheumatic pneumonia.

Pneumonia occurred only in the more severe types of infection, associated in every instance with rheumatic heart disease. Sixteen (49 per cent) of the group died of rheumatic heart disease. One died of diph-

10. Holt, E.: Chronic Adhesive Pericarditis in Childhood, Am. J. M. Sc. **178**:615, 1929.

11. Boas, E. P., and Schwartz, S. P.: Some Modes of Infection in Rheumatic Fever, Am. Heart J. **2**:375, 1927.

theria. The survivors lived for periods varying from three to twelve years, with an average of seven years.

Cutaneous Manifestations.—The incidence of subcutaneous nodules in this series (10 cases) indicates not the true incidence of rheumatic nodules in children in Philadelphia but rather the incidence of those nodules conspicuous enough to be discovered at cursory inspection. Such obvious nodules appeared in the more severe forms of the disease, being associated in every instance with serious cardiac damage. Fifty per cent of this group had died. The survivors had lived for an average period of three years since the appearance of the nodules, the longest duration having been eight years. Although most authors are agreed that the subcutaneous nodule is chiefly associated with carditis, it has been reported in a few persons presenting no obvious evidence of cardiac damage.[12]

Erythema annulare, noted in 10 instances, was associated with rheumatic heart disease in all but 1 case. Pericarditis had been observed in 2 cases, subcutaneous nodules in 2 and pulmonary complications in 3. Although only 1 death had occurred, these multiform erythematous lesions seemed to appear only as a result of severe infection.

The relation of purpura rheumatica to true rheumatic infection is a debatable subject. Six children in my series presented the symptom of purpura, 5 at the time of onset associated with articular pains and 1 five years after the onset and during an acute exacerbation with articular pains. One child died two years after the onset, presenting evidence of aortic and mitral disease together with pericarditis. Two others had rheumatic cardiac disease, 1 with aortic as well as mitral changes. Three presented no evidence of cardiac involvement.

Epistaxis.—Epistaxis was mentioned in 56 cases (13.2 per cent). In approximately half the cases nosebleeds occurred during acute exacerbations associated with other manifestations of rheumatic infection. In the remainder they occurred during intervals that were otherwise symptom-free. Seventy-five per cent of these children had rheumatic heart disease, 25 per cent presented no obvious evidence of cardiac damage and 16 per cent had died.

Abdominal Pain.—Abdominal pain was observed in 56 children (13.2 per cent). There was an accompanying pericardial friction rub in 13. In 35 the pain was associated with the appearance of acute arthritis. Sixty-two per cent of these 56 children had rheumatic cardiac disease; 35 per cent were dead.

Both the medical and the surgical staff members of the Children's Hospital are well aware of the acute abdominal manifestations of rheu-

12. Wilson, Lingg and Croxford.[4] Jones and Bland.[9]

matism. Despite their caution, however, 3 operations were performed on rheumatic children, all presenting only acute generalized mesenteric lymphadenitis. To emphasize the diagnostic difficulty it may be mentioned that in 2 other children with rheumatic cardiac disease an appendical abscess was found at the time of operation.

Acute Hemorrhagic Nephritis.—In recent years hematuria has been included among the many possible manifestations of the rheumatic state.[13] In the present series there were 8 instances of acute hemorrhagic nephritis. In three fourths of these children valvular cardiac disease developed; one fourth were dead as a result of cardiac involvement.

PROGNOSIS OF RHEUMATISM

The death rate in the group of 416 children traced after an average period of seven and one-half years since the onset of rheumatic infection was 22.3 per cent. Various statistical reports have been published for groups of rheumatic children observed during a ten year period (table 1). The original selection in each group has varied. Differences in the death rates may therefore have been inherent in the method of sampling rather than due to intrinsic variation in the severity of the disease in different localities. Coombs'[14] group in Bristol, England, comprised older children, with an average age at onset of 10 years. Eight per cent of these children were dead within five years and 17 per cent within ten years. In the present series there was a distinct drop in the death rate among the older children, who were first taken ill when between 9 and 11 years of age (table 3). Wilson's[4] series, restricted to children attending a clinic for patients with heart disease, excluded those with fulminating involvement as well as children who lived for several years but were bedridden "cardiac cripples" from the onset. Kaiser's[15] sample also may have failed to include patients with acute involvement. Stroud's[7] group from the Children's Heart Hospital in Philadelphia probably contained an unduly high percentage of children with severe cardiac damage or children who were referred because of continuous low grade activity. That proportion of the present group who had remained under the supervision of the clinic for at least one year was found to have a death rate of 12.4 per cent, a figure closely approximating that in Wilson's group. On the other hand, among the remaining patients, including a higher proportion of children who died

13. Coburn, A. F.: The Factor of Infection in the Rheumatic State, Baltimore, Williams & Wilkins Company, 1931.

14. Coombs, C. F.: Rheumatic Heart Disease, New York, William Wood & Company. 1924.

15. Kaiser, A. D.: Factors that Influence Rheumatic Disease in Children, J. A. M. A. **103**:886 (Sept. 22) 1934.

within the first year or who were too severely crippled for ambulant care, the death rate was 33.3 per cent, a figure approaching that for Stroud's group. The patients assembled in Boston and Glasgow, including all patients admitted to the wards, most closely resemble the present group with regard to composition and death rate. The slightly higher death rate in Philadelphia and Boston is influenced by the fact that these children were followed for two years beyond the end of the ten year period.

TABLE 3.—*Prognosis According to Age at Onset of Infection*

Age at Onset, Years	Total Number of Patients	Average Duration, Years	Valvular Heart Disease, Percentage	Deaths, Percentage	Percentage of Deaths		
					Within 1 Year	Within 5 Years	5 to 10 Years After Onset
2	6	9.0	67	33	100	100	0
3	33	7.7	64	18	33	67	33
4	37	8.5	70	50	30	65	35
5	57	7.8	70	33	37	79	21
6	70	7.4	69	20	20	73	27
7	70	7.0	60	17	25	75	25
8	45	7.3	58	26	58	90	10
9	36	7.2	64	8	33	67	33
10	32	7.0	63	16	0	80	20
11	26	7.0	69	8	0	50	50

TABLE 4.—*Prognosis According to Duration of Rheumatic Infection*

Duration, Years	Total Number of Patients	Deaths, Percentage	Valvular Heart Disease, Percentage	Functional Classification*				Deaths Due to Noncardiac Conditions, Number of Patients
				F, E, I, Percentage	IIA, Percentage	IIB, Percentage	Unknown, Number of Patients	
Over 10 (aver. 12)	87	45	74	39	12	1	1	2
10	121	40	74	40	16	2	1	2
7	237	30	71	47	16	6	4	2
5	323	20	68	51	14	8	12	2
2	416	11	64	..	..	..	..	2
1	416	8	..	..	..	..	..	..

* The functional classification is based on the "Criteria" of the American Heart Association.[2] F indicates potential heart disease; E, possible heart disease; I, physical activity not limited; IIA, activity slightly limited; IIB, activity greatly limited.

There was a startling death rate among those in whom the course of the disease was actually ten years or more (table 4). Of 87 children traced after an average period of infection of twelve years, 44.8 per cent were dead. Of 121 children with rheumatic infection, 40.5 per cent were dead ten years after the onset.

A further analysis of the figures for my series, however, revealed a picture that was not so discouraging (chart 4). Among the group of children whose infection had originated during the five years from 1922 to 1926, there were approximately twice as many deaths within the first five years (23.2 per cent) as among the group whose disease

had started within the five years from 1927 to 1931 (11.5 per cent). Among the entire group of 93 deceased children one third of the deaths had occurred within the first year, 51 per cent within two years and 74 per cent within five years of the onset. Since 32 per cent of the children in the present series had been ill for only five years or less, these figures cannot be applied to rheumatic infection as a whole. A lower incidence of early deaths would be expected as the duration of the disease increases. Of the deaths among those children first taken ill during the years from 1922 to 1926, 43 per cent occurred within two years and 68 per cent within five years, an incidence not sufficiently small when compared with the figures for the entire group.

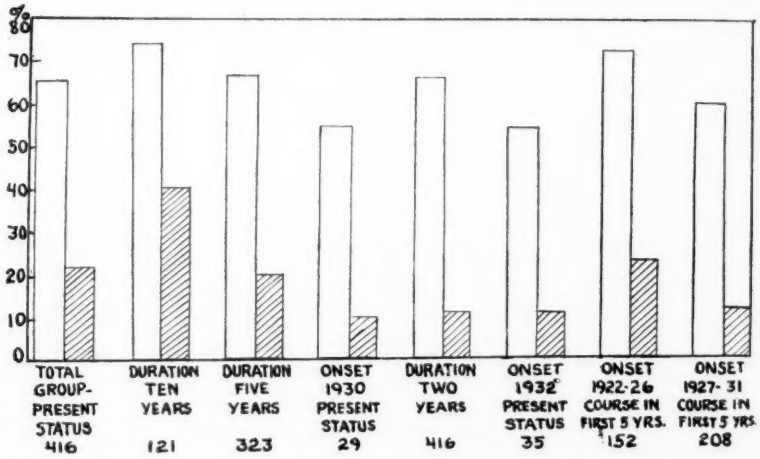

Chart 4.—Status of the rheumatic patients after varying duration of infection. There has been an apparent modification in the severity of the infection in recent years. The white columns indicate the cases of rheumatic cardiac disease, and the shaded columns, the fatal cases of cardiac disease.

It would be stimulating to think that the decrease in the early death rate within recent years has been due to the careful supervision of these rheumatic children by the physicians in the clinic for patients with heart disease. There are at least two other possibilities to be considered, however. There may have been a change in the policy regarding admission. Perhaps in the earlier years only patients with severe involvement were admitted. I doubt if this is so. It has never been the policy of the Children's Hospital to refuse patients referred by private physicians or other agencies. Each year there have been admitted a proportionate percentage of patients with early stages of infection as well as children with severely damaged hearts.

The second possibility is that within this period there may have been a spontaneous subsidence in the intensity of the infection—perhaps for only a temporary period. It is well known that the incidence of rheumatic infection fluctuates markedly from year to year. The peak within the period studied occurred in 1929 (chart 5), when the greatest percentage of children were admitted to the medical wards with rheumatic infection, when there was the highest incidence of the infection in any one year and when the largest number of deaths occurred. Since 1932 the percentage of children admitted with rheumatic infection has been increasing, and from present indications 1936 will show another peak.

Not only the incidence but the clinical characteristics may vary in different years. In one period there may be an undue number of patients with severe articular manifestations and only slight cardiac

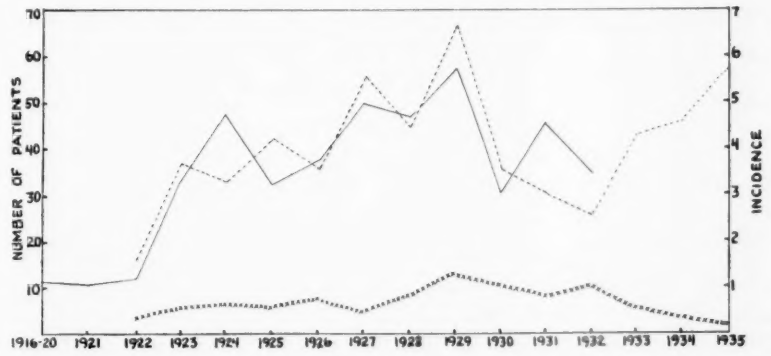

Chart 5.—Distribution of 445 cases of rheumatic infection according to the calendar year of the onset and of death and the number of patients admitted annually to the wards of the Children's Hospital. The solid line indicates the onset of infection (total series); the dash line, the incidence (percentage) of rheumatic patients in the Children's Hospital; the crosses, the deaths (total series).

involvement; in another there may be a series of patients without arthritis but with severe carditis or a series of patients with uncomplicated chorea.

Davis [16] investigated the incidence of rheumatic fever in two New York hospitals and found that despite a variable incidence from year to year there had been a steady decline in the absolute and relative number of patients with rheumatic fever admitted from 1897 to 1919, since which time there had been a slow increase. The incidence of carditis in rheumatic fever showed a reverse tendency—a rise until

16. Davis, J. S.: Incidence of Rheumatic Fever in New York City Hospitals, Am. J. M. Sc. **186**:180, 1933.

about 1919, after which there was a drop in the general slope of the curve. At the Children's Hospital in Philadelphia there seems to have been a similar tendency to a lessening in severity of rheumatism within recent years. The lowering of the death rate has already been mentioned. There has also been a decrease in the amount of cardiac involvement, at least during the early years of the infection. In table 5 is shown the outcome of the disease acccording to the calendar year of the onset of the infection. A comparison with table 4 shows that although in the entire group at two years and five years from the onset the percentage of cardiac involvement was approximately 65, the more recent cases at the same period showed a lower incidence of valvular damage. Even so one must not be too optimistic about a disease which within two years has crippled the hearts of over 50 per cent of the children with rheumatic infection and has already killed 10 per cent of them.

TABLE 5.—*Prognosis According to Calendar Year of the Onset*

Year of Onset	Total Number of Patients	Valvular Heart Disease, Percentage	Deaths, Percentage
1922	11	82	45
1923	27	74	37
1924	48	76	32
1925	30	80	37
1926	36	72	30
1927	37	67	18
1928	45	66	18
1929	56	57	16
1930	29	55	10
1931	41	58	10
1932	35	54	11

COMMENT

It is obvious that general summaries as to the course of rheumatic infection cannot be made from analyses of small groups. Can one combine the results obtained from careful studies in different localities, or is there a local variation in the character of the disease that would introduce an element of inaccuracy?

The influence of certain variable factors is brought out in this and other statistical studies. Does the original sample include patients with fulminating as well as those with mild involvement, and in proportionate percentage? What age limits are included? Seemingly manifestations are most severe in early childhood and again at puberty.[4] The duration of the disease is of course an obvious factor to be considered. What is the economic and racial status of the group? Possibly variations in the severity of the disease from year to year may necessitate a comparison of groups studied in similar periods.

If one takes into consideration these variable factors, it is probable, at least in the north temperate zone on the Atlantic seaboard, that

observed differences have been due to differences in the original samples and not in the disease itself. An addition of the various groups by smoothing out these differences would perhaps increase the accuracy of the picture. An analysis of the combined groups in Boston, New York and Philadelphia, for instance, gives a picture of 1,770 children with rheumatic infection acquired at an average age of 7 years, who after an average period of approximately seven years presented a death rate of 20 per cent and an incidence of cardiac involvement of 74 per cent.

There has been no study of a sufficiently large group observed beyond the ten year period following the onset of rheumatic infection in childhood.

SUMMARY

The course of rheumatic infection as observed in 445 children coming under observation at the Children's Hospital during the years 1922 to 1932 has been described. Ninety-three per cent of these children were observed for an average period of seven and one-half years after the onset of the infection, at the end of which time 66 per cent presented valvular heart disease and 22 per cent had died.

The course of the disease was modified by such variable factors as sex, racial origin, age at the onset of the infection and the calendar year of the origin.

Among the clinical manifestations, pericarditis, rheumatic pneumonia, involvement of both aortic and mitral valves, the early appearance of a button-hole mitral stenosis and subcutaneous nodules obvious on cursory inspection bore the most ominous prognosis. Chorea in itself was a mild manifestation. In an intermediate group may be placed epistaxis, abdominal pain, hematuria and the multiform cutaneous eruptions.

There is some evidence that within recent years there has been a lowering in the mortality and in the incidence of cardiac involvement. Although it is possible that intensive supervision in the clinic for patients with heart disease has been a factor, the modification of the disease is probably a natural phenomenon rather than the result of this supervision.

Since most of the children destined to show permanent cardiac damage had already done so by the end of the second year after the onset of the disease, the crucial period for treatment is within the first year after the onset.

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THE ABDOMINAL SYNDROME OF RHEUMATIC DISEASE IN CHILDHOOD

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A large percentage of children with rheumatic heart disease exhibit a group of frequently unrecognized gastro-intestinal symptoms as the only manifestation of an active rheumatic phase.

Digestive symptoms, especially abdominal pain in children, have been observed in various conditions apart from rheumatic infection.

Heiman and Cohen [1] reported instances of abdominal pain in children between the ages of 4 and 12 years due to enterospasm. The characteristic features of this pain are its frequent recurrence and the fact that it is usually referred to the region of the umbilicus. A chance finding in these cases is a spastic intestine, which feels cordlike and rolls easily on palpation. Atropine affords ready and prompt relief. The German writers term this condition *Nabelkolik*. Roentgenograms show a spasm of the intestine, usually in the ileocecal region or in the colon.

Frazer [2] attributed this condition to a functional neurosis in the gastro-intestinal tract. He explained this state as a condition of imbalance of the autonomic nervous system.

Haynes [3] pointed to defective gastro-intestinal mechanics, such as the development of peritoneal bands over the first part of the duodenum or over the angle of Treitz as the underlying factor in these chronic abdominal disturbances of children between the ages of 3 and 5 years.

Brennemann [4] attributed the abdominal pain in children during the course of infection of the throat to mesenteric lymphadenitis. Kerley [5] reported two cases in which operation was performed and adenitis of the right lower quadrant was found. In one case the gland in the immediate region of the appendix, which was not involved, was as large as the end of the thumb.

There is a group of symptoms, closely simulating any of the aforementioned conditions, which precedes an attack of rheumatism in child-

1. Heiman, H., and Cohen, P.: Tr. Am. Pediat. Soc. **40**:27, 1928.
2. Frazer, T.: Brit. M. J. (supp.) **2**:12 (July 3) 1926.
3. Haynes, R. S.: Tr. Am. Pediat. Soc. **42**:80, 1930.
4. Brennemann, J.: Tr. Am. Pediat. Soc. **39**:75, 1927.
5. Kerley, C. G., in discussion on Brennemann.[4]

hood and is associated with some mild manifestations of the disease. It seems reasonable, therefore, to assume that the two phenomena are related.

The earlier writers referred to abdominal rheumatism as of frequent occurrence (Ballonius in 1653 and Huzham in 1752). Mathieu,[6] in his description of nervous dyspepsia, recognized an intimate relation between this condition and arthritic states. Hanot [7] and Lyman [8] labeled the digestive symptoms "gastro-enteric rheumatism" and explained the abdominal manifestations as due to the selective action of toxins. This was in 1894 and preceded the work of Poynton and Pain in 1900. Lyman [8] reasoned that if the muscular layer of the stomach were involved there would be pain due to cramp, whereas if the secretory nerves were affected there would be pyrosis, hyperacidity, diarrhea or a combination of these symptoms. Dory [9] expressed the belief that digestive symptoms can be found in a considerable number of cases of rheumatic infection if they are looked for. In nine of twenty-six cases, these symptoms were prodromal and lasted from five to ten days. Zenzer,[10] in making cultures from children who died from rheumatic fever and endocarditis, found that the abdominal lymph glands and the spleen often harbor the streptococcus.

Giraldi [11] divided the abdominal symptoms of acute rheumatism into three groups: the digestive, the pseudo-appendicular and the peritoneal.

The relationship between appendicitis and rheumatism has been well described by Kelly and Hurdon,[12] Sutton,[13] and Nothnagel.[14] Opposed to the views of these authors are those of Poynton,[15] Edwards [16] and many others. Giraldi concluded that in some instances acute rheumatism may give rise to abdominal symptoms simulating appendicitis, and he objected to the term "rheumatic appendicitis." Such conditions he included in the pseudo-appendicular group.

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6. Mathieu, A., in Charcot, J. M.; Bouchard, C., and Brissaud, B.: Traité de médecine, Paris, G. Masson, 1892, vol. 3, p. 270.

7. Hanot, V.: Presse méd. **2**:171, 1894.

8. Lyman, H. M.: Tr. A. Am. Physicians **9**:237, 1894.

9. Dory, L.: Rheumatisme articulaire aigu et appareil digestif, Thèse de Paris, no. 131, 1925.

10. Zenzer, Z., cited by Blackfan, K. D., in discussion on Helmholz, H. F., and Bowers, M. R.: Tr. Am. Pediat. Soc. **40**:30, 1928.

11. Giraldi, J. J. J.: Arch. Dis. Childhood **5**:379, 1930.

12. Kelly, H. A., and Hurdon, E.: The Vermiform Appendix and Its Diseases, Philadelphia, W. B. Saunders Company, 1905, p. 381.

13. Sutton, J. B.: Lancet **1**:545, 1891.

14. Nothnagel, H.: Encyclopedia of Practical Medicine, Philadelphia, W. B. Saunders Company, 1904, vol. 6, p. 837.

15. Poynton, F. J.: Tr. M. Soc. London **24**:22, 1901.

16. Edwards, W. A.: Am. Med. **3**:595, 1902.

In the peritoneal group are included those forms in which there is evidence of invasion of the peritoneum by the virus of rheumatism, in other words, definitely proved acute rheumatic peritonitis.

Paul and Graham [17] reported localized peritoneal inflammation observed in the upper part of the abdominal cavity. Rolly [18] made a diagnosis of rheumatic peritonitis clinically during the life of the patient. Poynton [19] stated that in cases of fatal rheumatic fever chronic peritonitis may be noted at autopsy around the liver and spleen. He referred to a case in which he heard a peritoneal friction during life and also to a case in which the patient complained of pain over the upper part of the abdomen and in which peritonitis was demonstrated post mortem. We have demonstrated to students frictions over the liver in two children who complained of marked abdominal pain during an attack of rheumatic fever.

Von Glahn and Pappenheimer [20] demonstrated the presence of Aschoff bodies in the diaphragm in a case of rheumatic fever in which ascites was present.

We wish to call attention to a group of children in whom recurrent abdominal cramps lasted from six months to several years and apparently were the only subjective manifestation of an active phase of rheumatic disease. The cramps lasted from a few minutes to a few hours and recurred frequently. At times the child complained of being nauseated and even vomited. This episode was usually over before the next meal-time. The pain was more frequently felt around the umbilicus for a short time and then sometimes became generalized. The child put the hand over the entire abdomen to show where the pain was. Tenderness and rigidity were absent. Not until evidence of organic cardiac disease was accidently discovered were these experiences related to a physician and then only after persistent and pointed questioning. The recognition of this abdominal syndrome of rheumatic disease will aid in the early recognition of the condition in a fair percentage of rheumatic children before a structural pathologic condition of the heart develops.

The following cases illustrate the importance of recognizing the existence of an abdominal syndrome of rheumatic disease.

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17. Paul, J. R., and Graham, R. S.: Bull. Ayer Clin. Lab. Penn. Hosp., no. 10, 1926, p. 44.

18. Rolly, F.: Der akute Gelenkrheumatismus nebst Chorea minor und Rheumatoide, Berlin, Julius Springer, 1920.

19. Poynton, F. J., in Osler, W., and McCrae, T.: Modern Medicine: Its Theory and Practice, ed. 3, Philadelphia, Lea & Febiger, 1925, vol. 11, p. 165.

20. Von Glahn, W. C., and Pappenheimer, A. M.: Tr. A. Am. Physicians **42**: 72 and 230, 1927.

REPORT OF CASES

CASE 1.—S. T., aged 7 years, complained of frequent abdominal cramps, which at times became so severe that he doubled up. These continued from a few minutes to an hour. He presented many of the phenomena seen in low grade active rheumatic disease—occasional pain in the joints and muscles, a fairly marked diurnal variation in temperature, between 97 and 100 F., hemoglobinemia and weight fixation. He nevertheless attended school regularly and was one of the brightest pupils of his class. The cramps recurred from time to time over a period of a few years. Strangely, the pains would subside by the time he was examined, and there was no abdominal rigidity. Two years later he was seen while he was having severe abdominal pain with suggestive rigidity over the right rectus muscle. The leukocyte count was 15,000 at that time, and the temperature was 99.2 F. In spite of the fact that he told us that this attack was similar to the others, we felt that the symptoms and the physical signs were more than suggestive of appendicitis, and the surgeon confirmed the diagnosis. When the abdomen was opened, the entire peritoneum and the bowel were somewhat inflamed. There was an excessive amount of peritoneal fluid, and the appendix was also inflamed but no more than the cecum or any other portion of the intestinal tract. An appendectomy was performed, and the boy made an uneventful recovery. However, he continued to complain of abdominal cramps in no way different from those he had experienced previously. We then felt certain that the abdominal symptoms were manifestations of an active rheumatic state. He responded well to large doses of acetylsalicylic acid and phenobarbital. It was extremely strange that at the age of 11 years, four years after the abdominal manifestations first occurred, a mitral lesion was first discovered.

CASE 2.—A physician's child, 4½ years of age, was seen because of manifestations of low grade active rheumatic disease—pallor, weight fixation and occasional cramps in the upper part of the abdomen, which would be relieved by a drink of water or by massaging the stomach (remedies which the mother applied). The systolic phase of a pericardial friction rub was heard at the base of the heart. The second pulmonic sound was accentuated, and the heart rate was 96 per minute. The temperature was 99.5 F. The leukocyte count was 9,400, the hemoglobin content 65 per cent, and the erythrocyte count 4,000,000. The child was active and playful. She awoke one night with severe abdominal pain and vomiting. There was no history of indiscretion in diet. She was taken to the hospital. The abdominal pain had subsided, but the abdomen was somewhat tender. The temperature was normal in the morning but rose in the afternoon to 100.6 F. The leukocyte count was 11,400. There was no rigidity. Rectal examination for pain caused by displacement gave negative results. The pericardial friction rub was less marked than that of the night before. There were no changes in the other findings. The child appeared cheerful. Some members of the staff felt fairly certain that she was suffering from an acute exacerbation of chronic appendicitis. In view of the manifestations of active rheumatic disease an electrocardiogram was taken on admission, which revealed delay in auriculoventricular conduction time. Operation was postponed. The child was given salicylates and soon improved. Electrocardiograms taken on July 11, 16, 19 and 22, 1933, revealed the definite transitional variations seen in childhood rheumatism during the active phases of the disease. She continued to show evidence of rheumatic activity—marked diurnal variations in temperature, pallor, weight fixation and occasional pains in the joints and abdomen for three months, when the signs of rheumatic activity cleared up. The hemoglobin content of the blood rose to 78 per cent,

the leukocyte count was normal, the appetite improved and the temperature fluctuated between 97.4 and 99 F. So far there has been no recurrence of the abdominal manifestations.

CASE 3.—D. P., a Negro boy, was sent into the surgical service of the hospital on May 21, 1935, with a diagnosis of acute appendicitis. He was complaining of abdominal pain, which was first epigastric and later occurred over the left quadrant. He was nauseated and vomited a great deal.

Past Medical History.—The child had had measles, pneumonia and whooping cough. He was said to have been healthy, with the exception that he had frequent colds.

Examination.—At the time of admission the temperature was 102 F., the pulse rate was 122 and the respiratory rate was 24. Physical examination showed a well nourished young Negro boy, who appeared ill. There was anterior and lateral cervical adenopathy. The tonsils were enlarged. The lungs were clear. There was no gross widening of the area of precordial dulness. The apex beat was visible and palpable. The tone and rhythm were good. No murmurs could be heard. Abdominal examination showed peristalsis to be absent, but tenderness was present over McBurney's area. There was slight tenderness over the right wrist, which was otherwise normal. The patient was operated on on the same day, and the appendix, which grossly showed only some serosal infection, was removed.

Pathologic Examination.—Examination by Dr. Konzelmann, of the department of pathology, revealed the following conditions: "The specimen consisted of an appendix measuring 9 by 1 cm. The serosa was light gray and injected. The mucosa was thin and light gray. Small hemorrhagic areas were noted. Microscopic examination showed that the lymphoid follicles were hyperplastic. Deposits of fibrin were seen in the tunica propria and in the muscularis. An occasional neurotrophil was noted. The vessels of the serosa were engorged."

The postoperative course was characterized by continuous fever, the temperature ascending to 103 F. and on one occasion to 105 F., and by a rapid pulse. He was seen by the members of the department of cardiovascular diseases on June 8, 1934, and at that time appeared to be very dyspneic; the heart was enlarged to the right and left, and there was a systolic murmur at the apex, which was not transmitted. The sounds of the heart were distant. No thrills were audible; harsh breath sounds were heard over both lungs. Fluoroscopic examination revealed the cardiac shadow to be tremendously increased to the left and right, suggesting pericardial effusion. The heart measured 15.5 cm. in its transverse diameter and 19 cm. in the internal thoracic diameter. The retrocardiac space was normal. The electrocardiogram revealed regular sinus rhythm; an auriculoventricular conduction time of two-tenths seconds and a slight tendency to left axis deviation. A diagnosis was made of rheumatic fever (active), with pericardial effusion, cardiac enlargement, a slight delay in the auriculoventricular conduction time and a tendency to left axis deviation (class 2 B [20a]). Very large doses of acetylsalicylic acid were given, and the child improved rapidly.

In these cases the condition was not of the more common type. Most often we see children with very mild abdominal manifestations, which are transitory and therefore easily forgotten.

20a. Class 2B includes patients with organic heart disease whose activity is greatly limited.

Little do some parents know that a so-called innocent bellyache may be a manifestation of an active, crippling insidious disease. The parent's reluctant reply to even a pointed question as to whether a child complained of cramps is "Yes, you know, doctor, as is the case with children, when she complains of a bellyache, she takes a drink of water and feels better." Or, "Yes, he complains of pains in the stomach when spinach or something he dislikes is served." Invariably this symptom is minimized.

Except indiscretion of diet, active childhood rheumatism is probably the most important cause for such abdominal symptoms, provided, however, that the attacks of cramps are transitory and apparently inconsequential. Other manifestations of the active phase of rheumatic disease are frequently associated with it, such as: pallor, weight fixation in spite of a properly balanced diet, irritability without any apparent cause, twitchings and tics, often looked on as habit spasms because of their chronicity, aches and pains in various joints and muscles, often attributed to rapid growth, and enuresis after the control of the bladder has been established. In spite of the fact that several of these manifestations are invariably seen in any case, the condition is frequently overlooked, and an active rheumatic state is often unrecognized until organic heart disease is accidentally discovered during the course of a physical examination. We are convinced that the greatest degree of cardiac change occurs during the unrecognized active phase of the disease, as has been described in detail in a previous publication.[21]

CONCLUSION

Gastro-intestinal manifestions of rheumatic disease may be acute or chronic. The acute symptoms last for a very short period, from one hour to three days. The attack usually begins in the upper part of the abdomen, with a sharp pain which does not radiate. Often the pain comes on during the night, waking the child. It may occur in the morning after a hasty breakfast and is occasionally accompanied by emesis. Usually there is no vomiting, but a dull ache is present in the upper half of the abdomen, at times becoming localized around the umbilicus. The child does not refrain from taking food. He continues to play and complains only during attacks. The temperature is usually slightly elevated, rarely higher than 101 F. In the cases of extreme manifestations which simulate appendicitis, the temperature may go higher. The pulse rate is not markedly increased. An acute attack is rarely accompanied by diarrhea. In fact, constipation is the rule. The abdomen is somewhat tender, but there is no rigidity. Careful questioning will

21. Wolffe, J. B.: Rheumatic Heart Disease: Active and Arrested, Arch. Pediat. **50**:832 (Dec.) 1933.

elicit a history of slight nosebleed or of pain affecting the muscles of the thighs or of the calves of the legs. The past history in these cases must be carefully scrutinized and diligently elicited. At times, leading questions must be resorted to, for not only the children but the parents fail to recall any abnormal reactions during the course of the child's life. Mild transitory symptoms appear trivial to them although they have a pronounced influence on the diagnosis in these cases. Just as the growing pains are often disregarded, the abdominal manifestations of this treacherous malady are overlooked, and at some time later, when other manifestations evidence themselves, they are brought out in the history. It is the early recognition and treatment of the active phase of the disease which will prevent needless operation and often cardiac crippling.

The chronic form of gastro-intestinal rheumatic manifestation is characterized by its mildness. After the subsidence of the acute attack, minor attacks of fleeting abdominal pain may recur from time to time without any other sign, such as fever or vomiting. However, diarrhea alternating with periods of constipation is a frequent phenomenon of this chronic form. Often a faint so-called hemic murmur, which we believe to be a slight pericardial friction is detected in the second or third left interspace. This murmur, which is so trivial as to pass unnoticed in most cases, is referred to as nonpathologic. In the chronic form, the child has a fairly good appetite; in fact, were it not for the occasional mild bellyache this condition would never be thought of. Unlike repeated attacks of appendicitis, which become more aggravated with each succeeding bout, abdominal rheumatic disease becomes much milder with each succeeding attack. This is misleading from the pathologic standpoint, because it makes for a tendency to assume that less severe symptoms indicate diminished activity, whereas in reality the converse may be true.

ALLERGY DUE TO MENOTOXIN OF PREGNANCY

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One hesitates to report a case of allergy due to human emanation, not only because the condition is so rare and to date experimentally unattainable, but because of the fact, recently reemphasized by Vaughan and Fowlkes,[1] that allergy due to cohabitation is usually traceable to a substance about the offending person other than human emanation. Encouraged by Cooper's[2] recent report of allergy to human semen, however, we wish to report here the occurrence of bronchial asthma in a child due to the menotoxin of the mother during her pregnancy and puerperium.

Although the existence of menstrual toxin has been suspected and mentioned since Biblical times, the superstition was first put to scientific test by Dr. Béla Schick,[3] who in 1920 showed that freshly cut flowers held in the hand of a menstruating woman for from ten to thirty minutes on the first to the third day of her period would wither within a few hours.

Macht and Lubin,[4] two years later, in a more exhaustive study of menotoxin, showed that a substance was present in the menstrual blood, as well as in the blood serum and in practically all the body secretions of menstruating women, which was toxic to plants and animals. From their studies they concluded that menotoxin is related chemically not to endocrine gland extracts but rather to bile salts and oxycholesterol. It is heat resistant, occurs in appreciable concentration in periodic cycles and pharmacologically has a pressor (vasoconstrictor) effect.

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From the Pediatric Clinic and the Children's Allergy Section of the Mandel Clinic, Michael Reese Hospital.

1. Vaughan, W. T., and Fowlkes, R. W.: Allergic Reactions Associated with Cohabitation, J. A. M. A. **105**:955 (Sept. 21) 1935.

2. Cooper, W. L.: Semen Allergy in Children, J. Pediat. **7**:179 (Aug.) 1935.

3. Schick, Béla: Das Menstruationsgift, Wien. klin. Wchnschr. **33**:395, 1920.

4. Macht, D. I., and Lubin, D. S.: A Phyto-Pharmacological Study of Menstrual Toxin, J. Pharmacol. & Exper. Therap. **22**:413, 1922.

Several other investigators [5] have corroborated the toxicity of menstrual blood and sweat to plants and animals. Lánczos [6] expressed the belief that the toxic factor is a choline-like substance, and this possibility is corroborated by the fact that the choline content of sweat is greater just before and during the menstrual period. It may possibly be that the presence of this substance in the sweat is responsible for the peculiar body odor noticeable about many women at their menstrual periods.

Although menotoxin is not present in the blood of males or in that of females before puberty or after the menopause, menstruation per se is not a prerequisite for the appearance of menotoxin in the body fluids. The menstrual toxin appears in the blood in three to four week cycles regardless of whether or not menstruation occurs. Mommsen [7] has demonstrated its periodic recurrence in the blood and milk of nonmenstruating lactating women. Whether or not the menotoxin of pregnant is identical with that of nonpregnant women we are unable to state.

As far as the susceptibility of human beings to menotoxin is concerned, the fact that nursing infants not infrequently have colic and gastro-intestinal upsets during their mothers' periods is highly suggestive. We remember one nursing infant who had urticaria coincident with every period of its mother. This is not surprising in view of the evidence that menotoxin is present in all the body fluids, including milk.[8]

It has also been stated that the presence of menotoxin makes the blood of menstruating women unsuitable for transfusion because of the frequent reactions experienced by the recipients of such blood.[9]

The report by Harrison [10] of the occurrence of giant hives in a woman coincident with her periods should also be mentioned. This woman was found to be sensitive to an extract made from her menstrual pad, and she was successfully desensitized.

As far as we know, however, no case of allergy from menotoxin in a person other than a nursing infant or its mother has been reported.

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5. Sieburg, E., and Patschke, W.: Menstruation und Cholinstoffwechsel, Ztschr. f. d. ges. exper. Med. **36**:324 (May 29) 1923. Klaus, K.: Zur Frages des Menotoxins, Biochem. Ztschr. **163**:41 (Oct.) 1925.

6. Lánczos, Anna: Zur Frage des Menotoxins, Arch. f. exper. Path. u. Pharmakol. **156**:117, 1930.

7. Mommsen, H.: Zur Frage des Menstruationsgiftes, München. med. Wchnschr. **81**:1458 (Sept. 21) 1934.

8. Frank, M.: Menotoxine in der Frauenmilch, Monatschr. f. Kinderh. **21**: 474, 1921. Steinert, J., and Papp, G.: Examination of Toxicity of Human Milk During Menstruation, Orvosi hetil. **78**:38 (Jan. 13) 1934.

9. Mommsen, H.: Zur Frage des Menstruationsgiftes, Monatschr. f. Kinderh. **62**:93, 1934.

10. Harrison, W. T.: Case of Menstrual Allergy, J. A. M. A. **100**:738 (March 11) 1933.

REPORT OF A CASE

A. N., a 4½ year old Negro girl, the second of three children, was brought to the clinic in February 1934, with a history that for the previous ten months she had experienced a severe attack of bronchial asthma on about the fourteenth day of each month. In addition, on about the first of each month she had a minor attack of asthma. There was no knowledge of any offending substance, and the only instance of allergy known in the family was that an uncle on the maternal side had had asthma. The other children in the family were well.

The following interesting correlative history of the mother was obtained however: Ten months previously she had become pregnant, and on the fourteenth of each month thereafter instead of a regular menstrual period she had profuse leukorrhea, which lasted from five to seven days. During each of these periods the child, who slept with her mother, had a severe attack of asthma. The mother said that she had not employed any douche or deodorant during these periods which she had not used at other times.

The mother was delivered of a normal baby on Dec. 14, 1933, and on this night the patient, who had been in the same room with her mother up to two hours before the delivery, experienced her worst attack of asthma. The mother nursed her infant, and up to the time of entrance to the clinic, which was in her third puerperal month, she continued to have monthly periods of leukorrhea, which were accompanied by attacks of bronchial asthma in our patient.

The accompanying table illustrates in greater detail the chronological relationship of the child's asthmatic attacks to the mother's periods (table). We were surprised at the exactness with which the mother remembered the dates of the asthmatic attacks, until she explained to us that she always kept records of her periods and that she herself had been impressed by the fact that the child's asthmatic attacks occurred during her own periods.

Complete cutaneous testing revealed that the child was sensitive to ragweed, house dust, spinach, brussel sprouts, broccoli and cauliflower. The administration of weekly desensitizing doses of ragweed and house dust were begun, and the offending foods were removed from the diet. Intradermal injections of theelin, corpus luteum extract, the gonadotropic hormone from the urine of pregnant women and posterior pituitary extract caused no wheal formation.

A speculum specimen of the leukorrheal secretion of the mother was obtained on April 21, 1934, the last day of the mother's period, and extracts[11] were made from this as well as from a Kotex pad worn between periods and from an unused Kotex pad. Cultures made from the leukorrheal secretion and from the Kotex pads yielded colonies of Staphylococcus albus, Streptococcus viridans, Bacillus coli and a large unidentified coccus. Vaccines and filtrates were made from each of these organisms separately and from the whole group together. Intradermal tests made with all of them revealed the child to be sensitive to only one substance, namely, the leukorrheal extract. Repeated tests with this extract at weekly intervals created marked wheals with pseudopod formation, while the other extracts gave no such reaction.

We instructed the mother to have the patient sleep alone during her next period, in March 1934, with the result that for the first time in eleven months the child missed her attack of asthma. The next month, April, the child was allowed to sleep with her mother and again had an attack of bronchial asthma. In May the child slept alone and experienced no attack, and in June she was again allowed

11. Defatted saline extracts were employed in all instances.

Bronchial Asthma Due to Maternal Menotoxin: Chronological Correlative Table

Child's Attack of Asthma	Date			Mother
		1933		
		March	10–17	Last normal period
		April	10	Became pregnant
First severe attack	14–15		14–21	First leukorrheal period
Mild attacks lasting a few hours	1– 3	May June July Aug.		
Severe attacks lasting from 1 to 2 days	14–17	Sept. Oct. Nov.	14–21	Leukorrheal periods beginning on 14th or 15th and lasting from 5 to 7 days
Most severe attack she ever had; began in morning and lasted 24 hours	14	Dec.	14	Left home for hospital at 8 p. m., and was delivered of normal baby at 10 p. m.
		1934		
Mild attack	1	Jan.		
Severe attack	14		14–21	Leukorrheal period
Severe attack	17	Feb.	14–19	Leukorrheal period
No attack; did not sleep with mother for first time	..	March	14–21	Leukorrheal period
Severe attack; slept with mother	13	April	13–21	Leukorrheal period; extract made of vaginal specimen taken on 21st
Mild attack	19			
No attack; did not sleep with mother; positive intradermal tests with leukorrheal extract of 4/21/34;	..	May	9–16	Regular period
mild attack	31			
Severe attack; slept with mother	18	June	12–19	Regular period
Severe attack; from now on did not sleep with mother	9	July	10–18	Regular period
Mild attack	31			
No attack	..	Aug.	10–18	Regular period; baby 8 mo. old—weaned
		Sept.	10–20	Regular period
Mild attack	22			Extracts from vaginal secretions made 9/7, 9/17 and 9/26
Negative reactions to intradermal tests with extracts of 4/21/34				
		Oct.	10–20	Regular period
Mild attack; negative reactions to intradermal tests with extracts made in Sept.	21			
Slight cough but no wheezing	5–14	Nov.	9–14	Regular period, preceded by leukorrhea for 4 days
Slight cough but no wheezing	4	Dec.	5–12	Regular period, preceded by leukorrhea for 4 days
		1935		
No attack	..	Jan.	3–10	Regular period
Severe attack following "cold"	26			
No attack	..	Feb.	3–10	Regular period
Mild attack	24			
No attack	..	March	3–10	Regular period
Severe attack following "cold"	6			
No severe attacks		Apr. May June July Aug. Sept. Oct. Nov.		Regular periods at approximately 28 day intervals

to sleep with the mother and again experienced a severe attack. Since then the child has slept alone and has been free from the monthly attacks associated with her mother's menstrual periods. She still has occasional sporadic attacks, however, usually following an infection of the upper respiratory tract.

About seven months after coming to the clinic, when her new sister was 9 months old and involution of the mother's uterus was complete, our patient failed to react with wheal formation to intradermal injections of the leukorrheal extract to which she had previously reacted positively. Passive transfer also failed to reveal sensitivity to the leukorrheal extract. A new set of specimens of the leukorrheal secretion was therefore obtained from the mother immediately before, during and after her period in September 1934, but the child did not react positively to extracts made from any of these. Whether or not this is another example of the observation frequently made that prolonged freedom from the presence of an offending antigen may cause desensitization to it is only a conjecture.

SUMMARY

The occurrence of bronchial asthma in a child coincident with her mother's monthly periods of leukorrhea, which replaced menstruation, is reported. These attacks began with the onset of pregnancy in the mother and continued until the seventh month post partum except when the child was removed from the mother's bedroom.

The child reacted with active wheal formation to intradermal injections of an extract of the mother's leukorrheal discharge. This reactivity was lost nine months after the mother was delivered.

30 North Michigan Avenue.

8 South Michigan Avenue.

FAMILIAL CONGENITAL ADRENAL SYNDROME

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Bulloch and Sequeira in 1905 [1] established the relationship between tumor of the adrenal cortex and pseudohermaphroditism. As early as 1756, however, Cooke described a case of tumor of the adrenal gland in a girl of 7 years of age. She was very obese and had an abnormal growth of hair on the face and pubic region. No attempt was made to point out the part of the gland involved.

In 1910 Apert [2] studied a series of cases of tumor of the adrenal cortex in females and concluded that the varying symptomatology depended on the age at which the disease developed. He proposed the following classification:

Type 1. Hyperplasia of the embryonal period. In this type the internal organs are female, but outwardly there are masculine forms, such as undeveloped breasts, a hypospadiac penile-like clitoris and a vulva-like cul-de-sac.

Type 2. Hyperplasia of the fetal period. Here the anomaly is less marked. There is usually no doubt as to sex. The clitoris is large, and the uterus and ovaries are generally atrophic. Hypertrichosis is regularly present.

Type 3. Hyperplasia of the prepuberty period. In this type the anomaly is far less pronounced. There are moderate hypertrophy of the clitoris, moderate hypertrichosis and generalized adiposity.

Type 4. Hyperplasia of the menopause. The clinical picture during this period is indefinite. Adiposity and ovarian functional disturbances are common.

From the Department of Pediatrics, New York University Medical College and the Children's Medical Service of the Bellevue Hospital.

1. Bulloch, W., and Sequeira, J. H.: On the Relation of the Suprarenal Capsule to the Sexual Organs, Tr. Path. Soc. London **41**:189, 1905.

2. Apert, E.: Dystrophies en relation avec des lésions de capsules surrénales, hirsutisme et progeria, Bull. Soc. de pédiat. de Paris **12**:50, 1910.

Various modifications of Apert's classification have been suggested.[3] The symptom complex resulting from neoplastic or hyperplastic changes in the adrenal cortex was termed by Gallais[3a] *le syndrome génito-surrénal.*

Glynn[3d] in 1912 reported a series of cases of the genito-adrenal syndrome, four of which were in boys. The syndrome in males is characterized by the large size of the external genitalia without potency and with hypertrichosis. The boys are tall and show an accelerated calcification of the osseous centers. This accelerated calcification is seen also in females.

The early literature on the genito-adrenal syndrome was reviewed by Bulloch and Sequeira, Apert, Gallais and Glynn and later by Collet[4] and Kennedy and Lister.[5] The most recent review on this syndrome in children was made by Freedman[6] in 1932. He reported thirty-two cases, twenty-four in girls and eight in boys. Since then additional cases have been reported in children, the distribution as to sex being as follows: Player and Lisser,[7] a boy aged 5 years; van der Bogert,[8] a girl aged 2 years; Nobécourt,[9] a boy aged 8 years; Rowntree and Ball,[3c] a boy aged 30 months and a girl aged 4 years, and Kepler and his co-workers,[10] a girl aged 9 years. The clinical picture in the case reported by Player and Lisser bears a striking resemblance to that in our cases.

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3. (*a*) Gallais, Alfred: Le syndrome génitosurrénal; étude anatomo-clinique, Thèse de Paris, no. 225, 1912. (*b*) Cecil, H. L.: Hypertension, Obesity, Virilism and Pseudohermaphroditism as Caused by Suprarenal Tumors, J. A. M. A. **100:** 463 (Feb. 18) 1933. (*c*) Rowntree, L. G., and Ball, R. G.: Diseases of the Suprarenal Glands, Endocrinology **17:**263 (May-June) 1933. (*d*) Glynn, E. E.: The Adrenal Cortex, Its Rests and Tumors: Its Relation to Other Ductless Glands and Especially to Sex, Quart. J. Med. **5:**157, 1912.

4. Collet, Arthur: Genito-Suprarenal Syndrome (Suprarenal Virilism) in a Girl One and One-Half Years Old, with Successful Operation, Am. J. Dis. Child. **27:**204 (March) 1924.

5. Kennedy, C. M., and Lister, W. A.: Case of Suprarenal Hypernephroma, Lancet **2:**749 (Oct. 8) 1927.

6. Freedman, H. J.: Disturbances of Function of Suprarenal Glands in Children, Am. J. Dis. Child. **44:**1285 (Dec.) 1932.

7. Player, L. P., and Lisser, H.: Adrenal Sexual Precocity Caused by Tumors of the Adrenal Cortex: Case Report of a Boy Five Years of Age, Urol. & Cutan. Rev. **37:**758 (Nov.) 1933.

8. van der Bogert, Frank: Virilism and Hypertension in Infancy Associated with Adrenal Tumor, J. Pediat. **3:**629 (Oct.) 1933.

9. Nobécourt, P.: Genito-Adrenal Syndrome in Children, Progrès méd., May 12, 1934, p. 797; May 26, 1934, p. 882.

10. Kepler, E. J.; Kennedy, R. L. J.; Davis, A. C.; Walters, W., and Wilder, R. M.: Suprarenocortical Syndrome and Pituitary Basophilism: Presentation of Three New Cases, Proc. Staff Meet., Mayo Clin. **9:**169 (March 21) 1934.

In the two cases reported by Rowntree and Ball the diagnosis has not yet been verified at operation. These, including our three cases, brings the total number in children to forty-one (twelve in boys and twenty-nine in girls).

EMBRYOLOGY [11]

Adrenal tissue is present in all higher animals. In fishes its origin is single and intimately connected with the reproductive glands. In higher forms the adrenal tissue becomes associated with cells of the sympathetic nervous system. The completed gland is thus of dual origin.

In man the adrenal gland lies across the upper pole of the kidney and consists of a central portion, the medulla, surrounded by the cortex. The medulla is composed of chromaffin cells, which stain yellow with chromate salts. The cells of the cortex are more compact, have an abundance of fatty granules and stain with osmic acid.

The cortex is derived from the mesothelium of the wolffian ridge, from which the gonads arise, and extends from the pronephros to the cloaca. The cortical substance consists of three groups of cells occupying the interstices of the stroma. Beneath the connective tissue sheath there is a thin layer, the zona glomerulosa, in which the cells are more or less rounded. Beneath this lies the zona fasciculata, which constitutes the chief part of the cortex and consists of cells grouped in long columns arranged radially with reference to the surface. The innermost layer, the zona reticularis, consists of cells disposed in a reticular manner. The onset of puberty heralds a new and active growth of the cortex, and the three zones become more sharply defined.

PATHOGENESIS

Numerous theories have been advanced to explain the mechanism by which the adrenal cortex influences sexual alterations. Lipschütz [12] expressed the belief that the adrenal glands exercise a masculating effect on the sex glands. According to Crosbie and Smith,[13] the sexual characteristics are regulated by the interstitial cells of the gonads. This function, however, can be assumed by the adrenal cortex when there is a hypersecretion of the cortical cells. The process is essentially masculating and is enhanced in the presence of the male sex glands

11. Broster, L. R.: Review of Sex Characters with Special Reference to Adrenal Cortex, Brit. M. J. **1**: 743 (May 2) 1931; in Cunningham, D. J.: Text-Book of Anatomy, ed. 5, Baltimore, William Wood & Company, 1922.

12. Lipschütz, A.: The Internal Secretion of Sex Glands: The Problem of the "Puberty Gland," Baltimore, Williams & Wilkins Company, 1924.

13. Crosbie, A. H., and Smith, L. W.: Primary Tumors of the Suprarenal Capsule with Special Reference to Adrenal Virilism, Tr. Am. A. Genito-Urin. Surgeons **20**: 179, 1927.

and modified in the presence of the ovaries. Vincent [14] expressed the belief that the adrenal cortical secretion acts directly on the sex glands as an adjuvant to the testicular hormone in amplification of male characteristics and is not inhibited in the presence of the ovaries.

Others [15] attributed the syndrome to a hyperactivity of the normal physiologic function of the cortex, which is believed to be concerned with body growth and the development of secondary sexual characteristics. There are also some [16] who contend that the symptom complex is due to a pluriglandular disturbance, i. e., to a disturbance of the adrenal glands and the pituitiary gland, and a careful review of many case reports would justify the conclusion that in many cases the condition is of this variety. Blanchard [17] and Pierre Marie expressed the belief that the interstitial cells of the gonads are directly responsible for virilism.

According to Krabbe,[18] the adrenal cortex incorporates some of the testicular elements of the ovary during embryonic life to form a false adrenal cortex, and tumors of the adrenal cortex thus arise from these cells. This process of absorption is made possible by the close proximity of the adrenal gland and the ovaries in embryonic life, both of which, as well as the testes, arise from the genital ridge. The ovaries during embryonic life are hermaphroditic, the outer cortical portion being ovarian and the inner medullary portion testicular. Thus, Krabbe was of the opinion that tumors of the adrenal cortex in girls with virilism originate from the testicular cells of the ovaries and that, owing to a secretion of the testicular hormone, the characteristic syndrome of masculation is produced. When the tumors occur in boys, owing to displacement of testicular cells in the adrenal cortex, an early sex development becomes manifest.

Observers working with guinea-pigs and birds have also noted a close functional relationship between the sex glands and the adrenal glands. Animals showing well developed sex organs also showed large

14. Vincent, Swale: Internal Secretion and the Ductless Glands, London, E. Arnold & Co., 1924.

15. Falta, W.: Die Erkrankungen der Blutdrüsen, Berlin, Julius Springer, 1913. Neurath, R.: Die vorzeitige Geschlechtsentwicklung, Ergebn. d. inn. Med. u. Kinderh. **4**:46, 1909. Bulloch and Sequeira,[1] Rowntree and Ball,[3e]

16. Evans, H. M.: Present Position of Our Knowledge of Anterior Pituitary Function, J. A. M. A. **101**:425 (Aug. 25) 1933. A Series of Lectures on the Hypophysis, foreign letter, ibid. **101**:1167 (Oct.7) 1933. Lescher, F. G., and Robb-Smith, A. H. T.: A Comparison of the Pituitary Basophilic Syndrome and the Adrenal Corticogenital Syndrome, Quart. J. Med. **4**:23 (Jan.) 1935.

17. Blanchard, R.: Sexual Characteristics, Bull. Acad. de mèd., Paris **76**:47 (July) 1916.

18. Krabbe, K. H.: Relation Between Adrenal Cortex and Sexual Development, New York M. J. **114**:4 (July 6) 1921.

adrenal glands. Cyclic changes in the adrenal glands corresponding to the functional changes in the sex glands were also noted by some observers in female guinea-pigs. Brachet [19] also wrote convincingly of the close functional relationship between the adrenal cortex and the sex glands. However, Levy-Simpson and his co-workers [20] were unable to demonstrate that the feeding of a very potent adrenal cortical extract to normal and castrated young rats had any effect on the sex glands. It is thus difficult to harmonize their observation with clinical findings.

Until recently it was commonly believed that the genito-adrenal syndrome is regularly associated with a unilateral cortical tumor, usually a hypernephroma or an adenoma and very rarely a sarcoma. Little attention has been paid to cases of this syndrome unassociated with hypertrophy or tumor of the adrenal gland, though it forms, in the light of recent investigations, a distinct pathologic entity. Foggie and Montgomery [21] stated that bilateral cortical hyperplasia with or without miliary adenomas is commonly observed postmortem. It is constantly present in congenital pseudohermaphroditism in females, though when male sexual characteristics are acquired by females in later life the lesion is apparently an adenomatous tumor of the adrenal cortex, usually unilateral and often metastasizing.

In 1933 Broster and Vines [22] observed the presence of the genito-adrenal syndrome without glandular hypertrophy or a tumor. Using the ponceau-fuchsin stain, they were able to demonstrate in operative cases that the cytoplasm of certain cells of the adrenal cortex contained a vivid red granular material, mainly in the inner and in the middle zone. The intensity of the color varied with the clinical signs of virilism and bore no relation to the size of the gland. The reaction is spoken of by Broster and Vines as the "fuchsinophyl reaction." In one of their adrenalectomized patients the gland was of normal size (in fact, the smallest of a group), yet the stain showed the most vivid reaction in that gland. It corresponded exactly to the clinical picture, for the signs of virilism were also most prominent in this case, indicating that the syndrome is independent of the size or hypertrophy of the adrenal gland but dependent on the character of its cells. Though

19. Brachet, A.: Traité d'embryologie des vertébrés, Paris, Masson & Cie, 1921.

20. Levy-Simpson, S.; Kohn-Speyer, A., and Korenchevsky, V.: The Adrenal Cortex and Sex: Influence of Cortical Extract on Normal and Castrated Rats, Lancet **2**:1194 (Nov. 25) 1933.

21. Foggie, W. E., and Montgomery, G. L.: Adreno-Genital Syndrome: Illustrative Case with Special Reference to Its Relation to Cushing's New Pituitary Syndrome, Edinburgh M. J. **41**:29 (Jan.) 1934.

22. Broster, L. R., and Vines, H. W.: The Adrenal Cortex: A Surgical and Pathologic Study, London, H. K. Lewis & Co., Ltd., 1933.

the cells may appear morphologically the same as the other cortical cells, they are physiologically dissimilar. Broster and Vines were able to obtain the fuchsinophil reaction in the male fetus from the ninth to the seventeenth week and in the female from the eleventh to the eighteenth week. It was absent in both sexes after the twentieth week. They were also able to obtain a very weak reaction in the interstitial cells of the testes, corpus luteum and the anterior lobe of the pituitary gland. To exclude the possibility that the reaction may be due to postoperative changes in the gland, a control series of glands from patients without the adrenal syndrome was studied, but none yielded a positive reaction.

REPORT OF CASES

Family History.—The three children whose cases are herein reported are siblings. There are no other children in the family. The parents are normal in appearance and behavior. On examination the father was 165 cm. in height and weighed 60.14 Kg. The mother was 152 cm. in height and weighed 40.18 Kg. Gynecological examination of the mother gave entirely negative results. The Wassermann reaction of the blood of both parents was negative. Neither parent had suffered from any emotional shock or convulsion. There was no history of alcoholism or addiction to drugs. There had not been any instance of pseudohermaphroditism, true hermaphroditism or tumor on the paternal or maternal side, as far as was known nor was there any history of a disorder of the endocrine system. Both parents are in good health and have never suffered from any serious illnesses.

History of Patients.—CASE 1.—T. M., a boy, is the oldest of the three children. He was born on Jan. 19, 1929, following normal gestation and labor. The weight at birth was 3.74 Kg. Infancy was normal, and at the end of the first year the child weighed 10.2 Kg. He walked at 11 months of age and talked at 14 months. The first tooth appeared when he was 5 months of age, and at the end of the first year he had eleven teeth. He had measles at 2 years of age and chickenpox at 3 years.

He was first seen on Oct. 3, 1933, at the age of 4¾ years, and was seen at repeated intervals thereafter. He was a tall, frail-appearing child. The measurements of all three children, as shown by the last examination are presented in table 1. The head was normal in shape and size. The eyes and fundi showed no pathologic changes. The lungs were clear, and the action of the heart was good. The abdomen was soft, and, except for the liver, no palpable masses could be felt.

Neurologic examination gave negative results. Mentally the boy was dull,[23] and one was particularly impressed by his lack of modesty, as he exposed his genitalia willingly without embarrassment.

The penis was very large, approximating that of a normal adult. The testes and prostate also were like those of a normal adult. There was a moderate growth of long, red pubic hair of male distribution. The growth of hair was first noted by the parents at the age of 18 months.

23. This was our clinical observation on the first examination. It was confirmed on all subsequent clinical observations in spite of the relatively high intelligence quotient. Our observation also corresponded with the parents' appraisal of the children's intelligence.

Case 2.—M. M., a girl, was born on Feb. 4, 1930. Gestation and labor were normal. The weight at birth was 2.7 Kg. During infancy she was normal. The weight at 1 year was 9.4 Kg. The child walked at 1 year and talked at 11 months. The first tooth appeared when she was 4½ months of age, and by the end of the first year there were twelve teeth. She had had none of the diseases of childhood. When the child was first seen, at the age of 3 years, she appeared like a girl of 6 years. She had a good color and good tissue turgor but was not obese. The facies was normal, and there was no excessive growth of hair. There was a scant growth of hair in both axillae. The head was normal in shape and size. The eyes and fundi were normal. Examination of the lungs showed no abnormalities, and the action of the heart was good. The abdomen was soft, and no masses could be felt. The skin was not coarse, and there were no visible areas

M. M., aged 4½ years, with a penile-like clitoris which is the size and shape of a penis of a boy 5 years of age. A moderate growth of pubic hair is shown. There was a marked increase in height.

of pigmentation or abdominal striae. Neurologic examination gave negative results. The girl likewise appeared rather dull mentally [23] and showed a lack of modesty similar to that exhibited by the boy.

The clitoris was markedly hypertrophied, approximating in size the penis of a boy of her age. The ventral surface of the clitoris was covered with shiny mucosa such as that which lines the methra. The perineal opening suggested a pseudovaginal type of hypospadias. In the depth of this pocket, however, there was a small fringe of hymen, through which the cystoscope was passed. Vaginoscopy performed with complete dilatation showed a small cervix and a very small cervical opening. Cystoscopy showed a normal bladder. The urethral canal was about 1 cm. long and to this extent appeared normal. Bladder control was normal. A rectal examination gave negative results. There was a sparse growth of coarse

red pubic hair of male distribution over the vulva and pubes, which was first noted at 16 months. The hypertrophied clitoris, however, was seen at birth, and for several days there was a question as to sex.

CASE 3.—B. M., a girl, was born on March 8, 1933. Gestation and labor were normal. Infancy was normal. The child sat up at 5 months of age, and the

TABLE 1.—*External Measurements*

	T. M., Boy, Aged 6 Yr. 7 Mo.	M. M., Girl, Aged 5 Yr.	B. M., Girl, Aged 1 Yr. 11 Mo.
Total body length, mm.	1,336	1,168	785
Sitting height, mm.	750	655	468
Length of span, mm.	1,315	1,145	768
Biacromial diameter, mm.	275	233	175
Bi-iliac diameter, mm.	205	185	127
Lower extremity*	691	618	379
Weight, Kg.	23.2	17.4	10.9

* From the anterior superior spine of the ilium to the sole.

TABLE 2.—*Results of Laboratory Examinations*

	T. M.	M. M.	B. M.
Blood pressure, mm. of mercury			
Systolic	98	88	84
Diastolic	64	63	64
Pulse rate per minute	84	92	96
Blood chemistry (values in mg. per 100 cc.)			
Nonprotein nitrogen	28	27	37
Sugar	95	84	74
Serum calcium	9.5	10.1	8.6
Serum phosphorus	5.3	6.3	6.1
Cholesterol	122	154	132
Plasma chloride	604	626	602
Sugar tolerance test	Normal	Normal	Normal
Renal function test (phenolsulfonphthalein)	Normal	Normal	Normal
Wassermann reaction of blood	Negative	Negative	Negative
Blood count			
Red blood cells per c.mm.	5,240,000	5,750,000	5,350,000
White blood cells per c.mm.	8,900	9,700	11,200
Hemoglobin	85%	93%	88%
Urinalysis	Negative	Negative	Negative
Roentgenogram of			
Skull	Normal	Normal	Normal
Sella turcica	Not enlarged	Not enlarged	Not enlarged
Long bones	Normal; no osteoporosis	Normal; no osteoporosis	Normal; no osteoporosis
Type of pelvis	Male	Female	Female
Carpal center ossification	8 centers	7 centers	2 centers
Skeletal age	8 to 9 years	7 to 8 years	1 year
Intravenous urography on 3 occasions	No renal anomalies or tumor mass	No renal anomalies or tumor mass	No renal anomalies or tumor mass
Frank test (Frank, R. T.: Proc. Soc. Exper. Biol. & Med. **31**: 1204, 1934)	Negative	Negative	Negative
Basal metabolic rate, percentage	+8.3	+9.6	+13.2
Intelligence quotient	100	110	118

first tooth also appeared at 5 months. There was no history of convulsions or of any other illness. The patient was 7 months old when first seen. Three teeth were present at that time.

The infant appeared like a normal child of her age. Color and tissue turgor were very good. She looked more alert mentally than the children previously described. The body build was normal in all proportions. The head was normal

in shape and size, with no evidence of rachitis. The eyegrounds were normal. The action of the heart was good. There were no murmurs or enlargement. The lungs were clear. The abdomen was not protuberant. It was soft, and no palpable masses could be made out. The skin was normal in texture, and no areas of pigmentation or striae could be seen. Neurologic examination gave completely negative results.

There was a penile-like clitoris the size of a penis of a boy of the same age. The clitoris was grooved below and covered with mucosa such as lines the urethra. The perineum was closed off except for a small opening at the base of the clitoris through which the child voided. (The vagina was not explored at the request of the mother.) When the child was again observed several months later, the penile-like clitoris appeared more like a penis (hypospadiac), resembling that of the older sister. The hypertrophy of the clitoris in this case was also noted at birth. The vaginal opening was entirely closed then according to the mother, and an artificial opening was made at the time of birth. A rectal examination did not yield any positive information regarding the existence of a uterus and ovaries.

Course.—The patients have now been observed for almost two years, and the following changes were noted on the last examination, Sept. 9, 1935.

In case 1 there had been a gradual enlargement of the penis and a more abundant growth of pubic and axillary hair. The height had also increased proportionately.

In case 2 the clitoris was the shape and size of a penis of a boy of the same age. The pubic hair had grown much thicker; otherwise the child appeared the same as at the first examination.

In case 3 the clitoris had assumed the shape and size of a penis of a boy of the same age with hypospadias but a nonpatent urethra. There was also a very fine growth of pubic hair. No other changes were noted. No abdominal masses could be felt in any of our patients on the last examination.

COMMENT

Abnormalities of sexual development may be associated with lesions of the adrenal cortex, the anterior lobe of the pituitary gland, the ovaries and the pineal gland. A number of cases have been recently described in which both the adrenal and the pituitary gland are involved. Thus far no cases of testicular involvement have been reported.

Table 3 shows the more important differential features of the various syndromes resulting from lesions of the aforementioned glands.

Hormone studies as yet offer no significant aid in a differential diagnosis of virilism.

It is evident from table 3 that the cases reported here belong to the group in which the symptoms are known as the genito-adrenal syndrome. This syndrome may be confused with the adreno-pituitary type. In fact, the Mayos consider both syndromes as one, for, they contend, it is difficult to distinguish between the symptoms produced by derangements of the adrenal cortex and those produced by the anterior lobe of the pituitary gland. It is likely that prior to Cushing's [24]

24. Cushing, H.: Basophil Adenomas of the Pituitary Body and Their Clinical Manifestations (Pituitary Basophilism), Bull. Johns Hopkins Hosp. **50**:137, 1932.

TABLE 3.—*Differential Diagnosis of Virilism*

	Tumors of the Adrenal Cortex	Basophil Adenoma of the Pituitary Gland	Ovarian Tumors	Pineal Tumor	Pluriglandular Involvement
Age at onset	Young children and adolescents	Adolescents and adults	Any age	Children below 12	Adolescents and adults
Adiposity	Generalized; present in about 50%	Always present; very typical; is rapidly acquired; painful and limited to face, neck and trunk; extremities are spared	Generalized if present	Generalized early in disease; cachexia in terminal stage	Generalized if present
Hypertrichosis	Always present; pubic hair very early	Commonly present, especially on face and trunk	Not constant finding	Not commonly present	Usually present, especially on face and trunk
Hypertrophy of external genitalia	Marked hypertrophy of clitoris in girls and of penis in boys	Moderate hypertrophy of clitoris in girls when present; atrophy of penis in males	Moderate hypertrophy of vulva	Large penis and very large testes; a late manifestation	Moderate if present
Pseudohermaphroditism	In females only	No	No	No	?
Menstruation	Amenorrhea when disease develops after puberty	Amenorrhea constantly present in females	Premature menstrual cycle	No	Amenorrhea in females
Mentality	Slightly retarded	Normal	Normal	Precocious	Normal
Roentgenogram of Skull	Normal	Decalcification and osteoporosis	Normal	Normal	Normal
Sella turcica	Normal	May be enlarged	Normal	Normal	May be enlarged
Epiphyseal ossification centers	Accelerated	Normal	Normal	Normal	Normal
Dentition	Accelerated	Normal	Normal	Normal	Normal
Sex incidence	Females more common, in ratio of 4:1	Both sexes equally affected	Females only	Males only	Both sexes equally
Sugar tolerance	Normal	Lowered	Normal	Normal	May be lowered
Blood pressure	Normal	Hypertension	Normal	Normal	Normal
Basal metabolism	Normal	Low	Normal	High	Low
Summary of characteristic findings	Penile-like clitoris with pubic hair in young girls; undeveloped breasts at puberty; marked hypertrophy of penis in boys; marked increase in height; accelerated ossification of epiphyseal centers; sex reversal in females	Typical limited acquired obesity; abdominal striae, plethora; hypertension; erythremia; backache; hyphosis; fatigue and somnolence; hyperglycemia; impotence; vague pains; osteoporosis of bones of skull and spine; accelerated specific dynamic action of protein; anterior pituitary-like gonadotropic hormone in blood and urine	Vaginal bleeding early; hypertrophy of vulva; well developed breasts; early menstruation; palpable tumor; follicular hormone present	Precocious but well proportioned body development; precocious sexual maturity; premature development of secondary sex characteristics; later intracranial pressure; internal hydrocephalus; ocular paralysis; unequal pupils	Generalized adiposity; amenorrhea; vague pains; diabetes insipidus may be present

description of basophil adenoma of the pituitary gland many cases were erroneously reported as instances of tumor of the adrenal cortex. Though a tumor of the adrenal cortex was found in these cases at autopsy, the clinical manifestations may have been due largely or primarily to an adenoma of the pituitary gland, which was overlooked. The coexistence of the two lesions has been definitely established by Close [25] and others. This variety does not occur in infants, however, and is regularly associated with obesity, hypertrichosis, vague pains and amenorrhea in females. Diabetes insipidus may also be present.

Our cases could not be considered as instances of Cushing's [23] syndrome, for the patients failed to show the classic symptomatology; also, as Woollard [26] recently pointed out, the most striking manifestation of lesions of the adrenal cortex in females is the sex reversal, whereas lesions of the anterior lobe of the pituitary gland are unassociated with such changes. It is unlikely that the pituitary gland should be the source of a masculating hormone. It plays no part in sexual differentiation but exerts its effect on either the testes or the ovaries, stimulating each to greater activity. Due to the fact that embryologically the testes are monosexual, while the ovaries are bisexual, the sex reversal resulting from lesions of the adrenal cortex can occur only in females.

These cases are of unusual interest because of the familial occurrence, which naturally points to a hereditary basis. According to Macklin,[27] developmental defects are always hereditary, especially if they occur in more than one child in a family. Broster [28] mentioned a hereditary tendency in cases of the genito-adrenal syndrome and cited a case in twins and other cases in which near relatives were similarly affected. Rupilius [29] reported pseudohermaphroditism in two children in a family of six. The children had been baptized and reared as boys, but female organs were found at necropsy. He does not state the glandular involvement, if any. Apert [30] also reported two cases of pseudohermaphroditism in one family. O'Farrell [31] reported three cases

25. Close, H. G.: The Incidence of Adenoma of the Pituitary Body in Some Types of New Growth, Lancet **1**:732 (April 7) 1934.

26. Woollard, H. H.: Discussion on Suprarenal and Pituitary Tumors, Proc. Roy. Soc. Med. **27**:271 (Jan.) 1934.

27. Macklin, M. T.: The Rôle of Heredity in Disease, Medicine **14**:1 (Feb.) 1935.

28. Broster, L. R.: Adreno-Genital Syndrome, Lancet **1**:830 (April 21) 1934.

29. Rupilius, K.: Familial Occurrence of Pseudohermaphroditism, Arch. f. Kinderh. **100**:206, 1933.

30. Apert, E.: Die Erkrankungen der Blutdrüsen, Berlin, Julius Springer, 1928.

31. O'Farrell, J. M.: Hereditary Hermaphroditism, J. A. M. A. **104**:1968 (June 1) 1935.

of incomplete hermaphroditism in the same family stem, two sisters and a cousin, all females. Two other children in same family stem and of same generation were similarly afflicted. There were forty children born to six members of this family, and five of them were hermaphroditic, but no others in preceding or succeeding generations were in the least degree abnormal. O'Farrell attributed the abnormality to an embryonic error. He apparently excluded the possibility of a glandular etiology, and he did not mention the status of the adrenal glands.

The anatomic basis for the hyperactivity of the adrenal glands in these patients can only be conjectured. It seems unlikely that they would all present tumors of the cortex. It is assumed, though, that they would show a hyperplasia of the cortex of the fuchsinophil cells, with a resulting hypersecretion of these cells.

TREATMENT

The treatment of the adrenal syndrome is usually surgical. There are three methods of procedure, the choice of which depends on the type of lesion: (1) removal of the tumor when a diagnosis of tumor is definitely established; (2) unilateral adrenalectomy, as advocated by Broster and Vines,[28] when there is no hypertrophy or tumor, and, (3) bilateral subtotal adrenalectomy when there is marked bilateral hyperplasia of the cortex. The last operation is usually performed in two stages, and two thirds of each adrenal gland is removed.

Until Collet [4] reported the first successful operation for removal of a tumor of the adrenal cortex in a girl 2 years of age, with an amelioration of symptoms, surgical intervention always proved fatal. Since then many authors [32] have reported successful operative results in a single

32. Holmes, Gordon: Case of Virilism Associated with a Suprarenal Tumor: Recovery After Removal, Quart. J. Med. **18**:143, 1924-1925. Fordyce, D. H., and Evans, W. H.: Suprarenal Virilism with Report of Two Cases, ibid. **22**:557, 1929. Harris, E. W., and Plews, D. F.: Hypernephroma with Virilism in a Child of Three Years, Canad. M. A. J. **23**:244, 1930. Lisser, H.: Successful Removal of Cortical Tumor Causing Sexual Precocity in Boy Five Years of Age, Tr. A. Am. Physicians **48**:224, 1933. Kolodny, A.: Suprarenal Virilism in a Woman (Tumor of the Extrarenal Suprarenal Rests), J. A. M. A. **102**:925 (March 24) 1934. Walters, W.; Wilder, R. M., and Kepler, E. J.: The Suprarenal Cortical Syndrome: Report of Two Cases with Successful Surgical Treatment, Proc. Staff Meet., Mayo Clin. **9**:400 (July 3) 1934; The Suprarenal Cortical Syndrome with Presentation of Ten Cases, Ann. Surg. **100**:670 (Oct.) 1934. Broster, L. R.: Gardiner Hill, H., and Greenfield, J. G.: Adreno-Genital Syndrome Associated with Cortical Hyperplasia: Results of Unilateral Adrenalectomy with Histological Notes, Brit. J. Surg. **19**:557 (April) 1932. Goldzieher, M., and Koster, H.: Adrenal Cortical Hyperfunction, Am. J. Surg. **27**:93 (Jan.) 1935. Hicks, J. B.: Adenoma of the Adrenal Cortex, New England J. Med. **199**: 1140 (Dec. 6) 1928. Broster and Vines.[22] Broster.[28]

case and also in fairly large series of cases irrespective of the surgical method employed. This is undoubtedly due to improved surgical technic and to a more scientific preoperative and postoperative management. It is important to follow carefully all operative cases, and if signs of adrenal insufficiency becomes apparent a cortical preparation should be instituted at once.

Though we are convinced that all persons with the adrenal syndrome should receive the benefits of surgical treatment, we believe that to extirpate the adrenal glands in our patients at the present time would be inadvisable. Since the lesion is presumably bilateral, a unilateral excision at this early age may not prove of great value. At puberty there would be a reactivation of the remaining fuchsinophil cells with a corresponding aggravation of the clinical manifestations. After puberty, however, when changes in sex characteristics are no longer likely to occur, surgical intervention may well be in order. A unilateral adrenalectomy in one of our female patients would seem the procedure of choice. Plastic operations should also be attempted for cosmetic reasons. It is difficult to believe that a mere plastic operation such as amputation of the penile-like clitoris would suffice to alleviate the symptoms caused by a disorder of the endocrine system. Should the extirpated adrenal gland show positive changes with the staining method of Broster and Vines,[22] then a unilateral adrenalectomy in the other sister should also be done after puberty. We do not favor surgical intervention in the boy since there is no sex reversal and therefore no consequent gross anomaly. The important results of the work of Broster and Vines[22] in isolating and staining the cells responsible for the condition of maleness could hardly be evaluated at the present time. They have apparently opened a new chapter in the pathologic physiology of the adrenal cortex. Our cases, which have been observed for two years, will be studied further at frequent intervals and the progress reported.

SUMMARY

Three cases of the genito-adrenal syndrome in siblings are reported.

The disease evidently developed during some period of embryonal or fetal life.

The syndrome in many cases is dependent not on the size of the gland or on the presence of a tumor but on the character of the cells of the cortex. It is a qualitative rather than a quantitative factor.

Unilateral adrenalectomy at puberty would seem the procedure of choice in cases of this type in girls.

ANTHROPOMETRIC STUDY OF NEW-BORN INFANTS OF JAPANESE PARENTS IN AMERICA

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LOS ANGELES

The first attempt to measure new-born infants scientifically was made by Roederer [1] in 1753. Since then numerous authors have published their results, and it is seen that there is some variation in the measurements even for infants of the same race in different parts of the same country. According to Robertson,[2] it has long been noticed that anthropometric studies show the general size of the new-born of European parents in America and Australia to be greater than if the infants had been born in Europe.

AIM, MATERIAL AND METHOD OF PRESENT STUDY

The present study was conceived and formulated to answer the following questions:

1. What are the measurements at birth of infants born in America of Japanese parents as compared with those born in Japan of Japanese parents?

2. Are there variations in the characteristic body proportions at birth between the Japanese and other races?

The material on which the present study is based consists of the measurements of 202 full term infants born of Japanese parents recorded at the Japanese Hospital, of Los Angeles, the Southern California Japanese Hospital and the White Memorial Hospital and at my office. The survey was begun on April 1, 1932, and was concluded on Aug. 2, 1935, three years and four months later (table 1).

The fathers of these new-born infants were engaged in a variety of occupations; some were laborers, farmers, horticulturalists, clerks, small merchants, public officials and professional men. The majority were of the laboring class but were comparatively well-to-do for Japanese in California. Forty, or one fifth, of the 202 mothers were of the *Nisei*, or second generation in this country. The average age of the whole group was 25.22. The mothers' ages are shown in table 2; the parity, in table 3, and the seasonal distribution of the births, in table 4.

One infant was measured on the day of birth; none was measured later than the seventh day of life, the majority being measured on the third, fourth or fifth

1. Roederer, cited by Montague, H., and Hollingworth, L. S.: The Comparative Variability of the Sexes at Birth, Am. J. Sociol. **20**:335, 1914.

2. Robertson, T. B.: Studies on the Growth of Man, Am. J. Physiol. **37**:1, 1915.

day, in order to allow time for the subsidence of any birth trauma and yet to forestall changes due to extra-uterine growth. The measurements taken were as follows:

1. Height—the total length from vertex to heel
2. Greatest circumference of the head—corresponding to the plane of the occipitofrontal diameter

TABLE 1.—*Number and Sex of the New-Born and Place of Measurement*

Total Number of Infants	Boys	Girls	Place of Study
134	59	75	Japanese Hospital, of Los Angeles
29	11	18	Southern California Japanese Hospital
28	14	14	White Memorial Hospital
11	10	1	My office
202	94	108	

TABLE 2.—*Ages of the Mothers*

Age, Years	Number	Age, Years	Number	Age, Years	Number
17	1	26	15	35	6
18	5	27	7	36	4
19	8	28	7	37	2
20	21	29	9	38	0
21	15	30	6	39	3
22	21	31	5	40	0
23	14	32	7	41	1
24	21	33	1		
25	18	34	5		

TABLE 3.—*Parity of the Mothers*

	Number	Percentage
Primiparas	113	55.94
Multiparas	82	40.56
Parity unknown	7	3.40

TABLE 4.—*Monthly Distribution of Births*

Month	Number	Month	Number	Month	Number
January	11	May	17	September	23
February	10	June	17	October	17
March	24	July	20	November	12
April	18	August	24	December	9

3. Circumference of the chest at the level of the nipples
4. Circumference of the abdomen at the level of the umbilicus
5. Sitting height—the distance between the plane of the vertex and the ischial tuberosities
6. Span—the distance from left finger-tips to the right finger-tips with the arms stretched sideways
7. Breadth of the shoulders—the distance between the tissues overlying the acromion processes
8. Breadth of the chest—the distance between the sides of the chest at the plane of the nipples
9. Breadth of the hips—the intercristal diameter, or the greatest distance between the iliac crests
10. Length from the crown to the shoulders—the distance between the plane of the vertex to the plane of the shoulders
11. Length from the crown to the navel—from the plane of the vertex to the navel

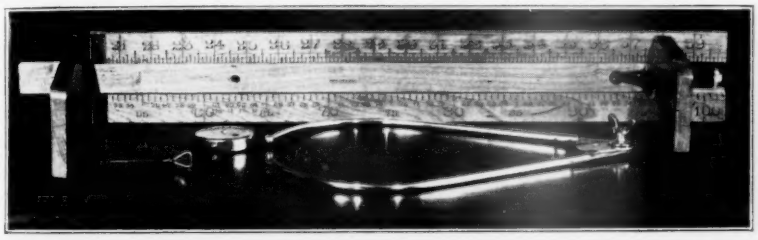

Fig. 1.—Measuring instruments.

12. Length of the trunk—the distance from the suprasternal notch to the lower border of the symphysis pubis
13. Length of the arm—from the tip of the acromion process to the tip of the middle finger
14. Length of the leg—from the greater trochanter to the heel
15. Length of the hand—from the fold at the wrist to the tip of the middle finger
16. Length of the foot—from the heel to the tip of the great toe

The weight was taken on a beam scale measuring pounds and ounces and then computed in grams. The total height and sitting height were measured by the modified Dumay infantometer in millimeters.

The length of the arms, legs, hands and feet, the span of the arms and the circumference of the head, chest and abdomen were measured with a metal tape measure obtained from the American Child Health Association. This tape measure is an ordinary steel metric tape rolled in a spring coil case with a Gulick spring handle attachment. The tension of the spring in the handle is balanced against the spring in the coil of the instrument. The length from the crown to the shoulder, the length of the trunk, the shoulder breadth, the width of the chest, the breadth of the hips, the crown to navel length and the diameters of the head were measured with a pelvimeter (fig. 1).

RESULTS AND COMPARATIVE STUDY

Table 5 gives the maximum, minimum and average weights and sixteen body measurements of the 202 infants studied. Table 6 presents

TABLE 5.—*Body Measurements and Range of Variation*

	Male (94)			Female (108)		
	Max.	Min.	Av.	Max.	Min.	Av.
Weight, Gm.	4,082	2,267	3,251	4,337	2,324	3,231
Height, cm.	55.0	44.5	50.0	54.0	44.5	49.7
Circumference of head, cm.	37.5	31.6	34.0	37.0	28.0	33.8
Circumference of chest, cm.	36.0	29.0	32.0	35.2	28.0	32.0
Circumference of abdomen, cm.	33.0	26.0	29.9	35.9	26.6	30.5
Sitting height, cm.	35.6	30.2	33.1	36.8	30.5	33.4
Span of arms, cm.	51.5	41.9	46.9	52.7	44.0	47.4
Breadth of shoulders, cm.	16.5	7.0	11.1	13.5	10.0	11.4
Breadth of chest, cm.	12.0	8.8	9.6	13.5	8.0	9.4
Intercristal breadth, cm.	11.0	7.0	8.9	13.0	7.0	8.8
Crown to shoulder, cm.	15.0	11.0	12.8	14.0	12.0	13.1
Crown to navel, cm.	29.0	25.0	26.8	29.0	25.4	26.8
Length of trunk, cm.	24.0	19.0	20.4	24.0	16.9	19.9
Length of arm, cm.	23.0	18.0	19.7	22.3	16.5	19.8
Length of leg, cm.	24.5	16.5	19.8	23.0	18.5	20.6
Length of hand, cm.	7.0	5.5	6.1	7.1	5.1	6.0
Length of foot, cm.	9.3	7.2	8.1	9.0	7.0	7.9

TABLE 6.—*Average Body Proportions of Japanese New-Born Infants as Given by Different Authors*

	Yoshinaga						Mishima		Sakaki		Miwa		Seichi and Okuta	
	Boys			Girls			Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	Max.	Min.	Av.	Max.	Min.	Av.	Av.	Av.	Av.	Av.	Av.	Av.	Av.	Av.
Weight, Gm.	4,000	1,300	3,060	3,750	1,300	2,950	3,040	2,870	3,060	2,714	2,865	2,862	2,979	2,853
Height, cm.	61	42	49.4	58	42	48.5	49.1	48.7	50.4	47.3	48.8	48.1	49.7	49.6
Sitting height, cm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31.4	30.4
Occipitofrontal circumference, cm.	44	29	33.4	36.5	27	32.7	33.8	33.3	32.6	32.0	33.1	33.4	33.1	32.9
Chest circumference, cm.	.....	.....	31.8	.....	.....	31.6	32.4	32.3	.....	.....	.....	.....	31.5	30.9
Span of arms, cm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48.4	48.1

the maximum, minimum and average weights and five body measurements of new-born infants in Japan as presented by five different authorities.[3] It will be noted that the average size of the new-born

3. Yoshinaga, S.: The Developmental Standard of Japanese Infants, Jap. J. Pediat. **357**:147 (Aug.) 1929. Mishima; Sakaki, J., and Miwa, J., cited by Miwa, S.: Kurzgefasstes Lehrbuch der Kinderheilkunde, Tokyo, Japan, Nansan-Do, 1930, p. 19. Seichi and Konaka: Pelidiss of Japanese Infants, Jap. J. Pediat. **331**:1, 1927.

of Japanese parents in America, except for the span of the arms, is greater than that of the new-born in Japan. Table 7 shows the range of variation in body measurements of the new-born in America and Europe as noted by Taylor [4] and Weissenberg.[5] The Caucasian new-born in America exceed the Japanese new-born in every respect except the length of the leg. The Japanese new-born exceed the European new-born in the circumference of the head, the circumference of the chest and the length of the foot. In other words, the measurements of the Japanese new-born in America are between those of the American-born Caucasians and those of the new-born of Japan.

TABLE 7.—*Range of Variation in Body Measurements* *

	Taylor						Weissenberg					
	Boys			Girls			Boys			Girls		
Measurements	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.
Span of arms	573	450	515	588	460	505	...	...	486	...	...	480
Total length of body	570	452	512	566	450	500	540	475	508	530	432	500
Occipitofrontal circumference	378	298	347	368	306	341	355	305	327	350	290	326
Sitting height	377	312	343	374	292	339	365	312	333	364	300	333
Chest circumference	358	280	323	415	248	321	320	255	282	320	250	285
Length of trunk	260	190	224	258	189	224	240	195	214	240	190	212
Length of arm	234	176	203	222	180	197	235	195	214	225	185	210
Length of leg	220	162	190	221	158	188	222	180	205	218	170	203
Shoulder breadth	142	104	121	137	104	119	122	90	107	120	90	104
Length of head and neck	134	105	119	130	100	115	...	...	...	...	...	...
Intertrochanteric diameter	101	77	91	101	78	89	...	...	...	...	...	...
Length of head	99	72	84	95	70	83	...	...	...	...	...	...
Length of foot	96	67	83	92	72	81	83	73	78	83	65	78
Length of hand	84	62	72	78	60	70	70	58	64	75	58	64
Crown to shoulder	...	...	...	...	...	...	135	115	124	135	105	121
Breadth of hips	...	...	...	...	...	...	87	70	78	83	68	77
Weight	4,890	2,515	3,484	4,325	2,450	3,377	General average 3,430					

* The weight is given in grams; all other measurements are in millimeters.

The new-born present certain definite peculiarities as regards their body proportions, as stated by von Reuss.[6] From the present study

4. Taylor, Rood: The Measurements of Two Hundred and Fifty Full-Term, New-Born Infants, Am. J. Dis. Child. **17**:353 (May) 1919.

5. Weissenberg, S., cited by Grulee, C. G., and Bonar, B. E.: The Newborn: Physiology and Care, New York, D. Appleton & Co., 1926, vol. 2, p. 20.

6. von Reuss, A.: The Diseases of the Newborn, New York, William Wood & Company, 1927, p. 7.

the following results were obtained, and the contrast to the Caucasian new-born is worth recording.

The new-born of Japanese parents in America show the following proportions:

1. The height, or total body length, is greater than the span of the arms. This is the same as in the new-born in Japan but is the reverse of the findings for Caucasians, as noted by Grulee.[7]

2. The center of the body is slightly below the navel. This is true of all Japanese, whether born in America or in Japan. According to Taylor, this finding varies for Caucasians.

3. The length of the trunk is greater than the length of the arms and legs. This is true of all Japanese and also of Caucasian infants, as stated by von Reuss and Grulee.

TABLE 8.—*Average Measurements of the Head at Birth in Centimeters*

Diameter	Present Group, Japanese	Williams, American	Riggs		Shanta, European
			White	Negro	
Occipitofrontal	11.44	11.75	11.71	11.26	11
Bitemporal	7.90	8.00	8.00	7.81	8
Biparietal	9.40	9.25	9.25	9.05	9
Occipitomental	13.60	13.00	13.33	13.31	13
Suboccipitobregmatic	9.87	9.50	9.70	9.29	9

4. The occipitofrontal circumference of the head is slightly greater than the sitting height and definitely greater than the circumference of the chest. The same is true for Caucasians.

5. The occipitofrontal circumference is definitely greater than the circumference of the abdomen. According to Grulee the reverse is found for Caucasians.

6. The length of the foot exceeds the length of the hand, as in Caucasians.

7. The length of the leg exceeds the length of the arm. This is the reverse of the finding for Caucasians, as stated by Grulee and von Reuss.

Table 8 gives five cranial diameters of 28 new-born Japanese infants in America together with a series of records of American infants, as recorded by Williams,[8] American and American Negro infants, as

7. Grulee, C. G., and Bonar, B. E.: The Newborn: Physiology and Care, New York, D. Appleton & Co., 1926, vol. 2, p. 21.

8. Williams, J. W.: Obstetrics, ed. 5, New York, D. Appleton & Co., 1924, p. 166.

recorded by Riggs,[9] and Europeans, as recorded by Schanta.[10] From this table it is seen that the occipitofrontal diameter of the Japanese new-born is slightly smaller than that of the American new-born but exceeds that of European and the American Negro infants. The biparietal, occipitomental and suboccipitobregmatic diameters of Japanese infants are definitely larger than those of the other races, while the bitemporal

TABLE 9.—*Deviation from Standard Measurements*

	Average	Maximum	Minimum	Standard Deviation	Coefficient of Deviation, Percentage
Boys					
Height, mm.	500	550	445	19.30	3.86
Span of arms, mm.	469	515	419	25.74	5.39
Occipitofrontal circumference, mm.	340	375	316	11.20	3.29
Chest circumference, mm.	320	356	290	14.68	4.58
Weight, Gm.	3,251	4,082	2,267	401.95	12.68
Girls					
Height, mm.	497	540	445	16.52	3.33
Span of arms, mm.	474	527	400	23.09	4.88
Occipitofrontal circumference, mm.	338	370	280	12.40	3.67
Chest circumference, mm.	320	352	280	14.85	4.64
Weight, Gm.	3,231	4,337	2,324	351.42	10.85

TABLE 10.—*Deviation from Standard (Taylor)*

	Average	Maximum	Minimum	Standard Deviation	Coefficient of Deviation, Percentage
Boys					
Height, mm.	512	570	452	21.045	4.11
Span of arms, mm.	515	550	450	20.898	4.05
Occipitofrontal circumference, mm.	347	378	298	11.270	3.24
Chest circumference, mm.	323	358	280	15.235	4.71
Weight, Gm.	3,483	4,890	2,515	432.470	12.41
Girls					
Height, mm.	500	566	450	20.4702	4.094
Span of arms, mm.	505	588	460	22.1273	4.380
Occipitofrontal circumference, mm.	341	368	306	12.2732	3.599
Chest circumference, mm.	321	415	284	17.7195	5.520
Weight, Gm.	3,377	4,325	2,450	408.55	12.090

diameter is smaller except in comparison with that of the American Negro infant.

For measuring the gross variability I used Pearson's standard deviation instead of the average deviation. This was obtained, according to

9. Riggs, cited by Williams, J. W.: Obstetrics, ed. 5, New York, D. Appleton & Co., 1924.

10. Schanta, F., cited by von Reuss,[1] p. 10.

Taylor,[4] as follows: If m_1, m_2, m_3, . . . m_n are items, n in number, having the respective deviations from the average of d_1, d_2, d_3 . . . d_n, and if the average magnitude is represented by a, then the standard deviation, σ, is obtained from the formula $\sigma = \sqrt{\frac{\Sigma d^2}{n}} = \sqrt{\frac{\Sigma (m-a)^2}{n}}$. It is found that 71.42 per cent of all the items, e. g., 71.42 per cent of 94 full term new-born boys, will show a deviation from the average body length of no more than the number corresponding to σ, the standard deviation, which is the absolute measure of dispersion (in this case 19.3 mm.); and similarly 71.11 per cent is found for the girls (for whom the deviation is 16.52 mm.). A relative measure of dispersion is used in comparing statistics from various sources. This relative mea-

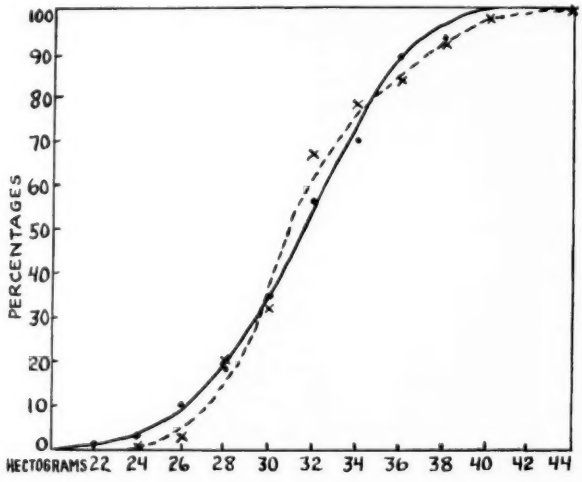

Fig. 2.—Curves showing the weight of the infants. In figures 2 to 6 the solid line represents the weights of the boys, the dash line, those for the girls.

sure is known as the coefficient of deviation and is obtained by dividing the standard deviation by the quantity representing the average. In the present group the average height of the new-born boys was 500 mm., and the absolute measure of dispersion, or the standard deviation, 19.3 mm., divided by 500 mm., gives a quotient of 3.86 per cent. The results obtained in this study are almost identical with those found by Taylor for the American new-born, showing that the gross variability and coefficient of deviation of Caucasian and those of Japanese new-born infants are nearly the same (tables 9 and 10).

To show the degree of variation, Taylor used graphs with cumulative percentage ogival curves, percentages being shown on the ordinate and the corresponding measurement on the abscissa. From these curves

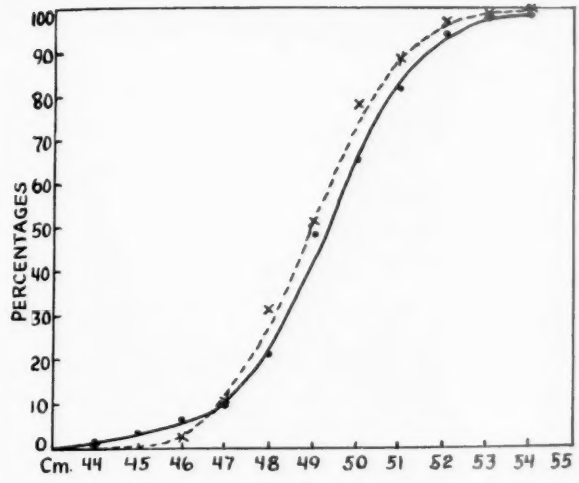

Fig. 3.—Curves showing the height of the infants.

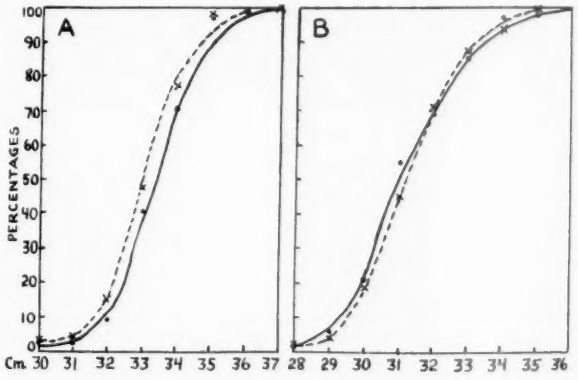

Fig. 4.—Curves showing the circumference of the head (*A*) and of the chest (*B*).

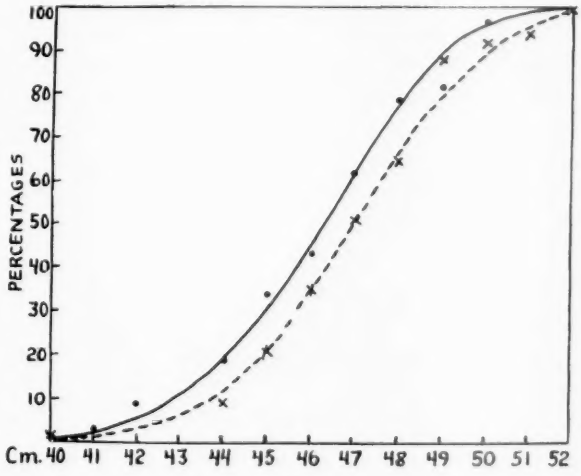

Fig. 5.—Curves showing the span of the arms.

the percentage can be obtained for any measurement or any range concerning which information is desired. Generally speaking, the curves obtained in my study correspond very closely with those of Taylor, except those for the span of the arms, the chest circumference and the total body length; in these measurements the curves for the boys did not absolutely dominate over those for the girls, as found by Taylor (figs. 2 to 5).

SUMMARY

Two hundred and two infants born of Japanese parents in America were measured, and a comparative study was made with Japanese infants born in Japan and with the infants of other races born in America and Europe.

The average measurements of the American-born Japanese infants are definitely larger than the average measurements of infants born in Japan but are slightly smaller than those of the Caucasian infants born in America.

The body proportions are generally the same for Japanese infants, whether they are born in Japan or in America. There are certain proportions for the Caucasian new-born which are the reverse of those for the Japanese new-born, such as the relationship of the height to the span, of the occipitofrontal circumference to the circumference of the abdomen and of the length of the leg to that of the arm.

The measurements of the head show that certain diameters are consistently larger in Japanese infants than in those of other races, while other diameters are smaller. The biparietal, occipitomental and suboccipitobregmatic diameters are larger in Japanese infants than in infants of other races.

The gross variability and coefficient of deviation of the measurements of Caucasian and Japanese infants born in America are found to be nearly the same.

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PULMONARY GANGRENE IN CHILDREN

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Excellent clinical and anatomic descriptions of pulmonary gangrene were made as early as 1808 by Laennec.[1] Not long after the introduction of good microscopes, spiral organisms, probably oral spirochetes, were observed in pulmonary gangrene by Leyden and Jaffe (1867).[2] Recent investigations of the disease date from the report of Rona,[3] who in 1905 called attention to the presence of spirochetes in pulmonary gangrene and stated that carious teeth were the probable source of these organisms. Numerous other observers have since reported the presence of oral spirochetes in pulmonary gangrene, and the microbic nature of the disease has been established by the experimental production of gangrene in lower animals (Veszpremi,[4] Loygue, Bonnet and Peyre,[5] Kline,[6] Pilot and Davis[7] and Smith[8]). In 1923 Kline[6] produced gangrene in guinea-pigs by the injection into traumatized tissue of material not only from pulmonary gangrene but also from Vincent's angina, dental caries and ulcerative gingivitis. Pulmonary gangrene was produced in rabbits by intrabronchial injections of material from pulmonary gangrene and from dental caries containing innumerable oral spirochetes, fusiform bacilli and other organisms. In 1927 Smith[8] reported the production

From the Pediatric Service, Mount Sinai Hospital.

1. Laennec, R. T. H.: De l'auscultation mediaté, ou traité du diagnostic des maladies des poumons et du cœur, Paris, J.-A. Brosson & J.-S. Chaudé, 1819; A Treatise on the Diseases of the Chest, translated by John Forbes, Philadelphia, J. Webster, 1823.

2. Leyden, E., and Jaffe, M.: Ueber putride (fötide) Sputa nebst Bermerkungen über Lungenbrand und putride Bronchitis, Deutsches Arch. f. klin. Med. **2**: 488, 1867.

3. Rona, S.: Zur Aetiologie und Pathogenese der Plaut-Vincentschen Angina, Arch. f. Dermat. u. Syph. **74**:171, 1905.

4. Veszpremi, D.: Centralbl. f. Bakt. (Abt. 1) **38**:136, 1905.

5. Loygue, Bonnet and Peyre: Bull. et mém. Soc. méd. d. hôp. de Paris **42**: 1099, 1918.

6. Kline, B. S.: Experimental Gangrene, J. Infect. Dis. **32**:481 (June) 1923.

7. Pilot, I., and Davis, D. J.: Studies in Fusiform Bacilli and Spirochetes: Their Rôle in Pulmonary Abscess, Gangrene and Bronchiectasis, Arch. Int. Med. **34**:313 (Sept.) 1924.

8. Smith, D. T.: Oral Spirochetes and Related Organisms in Fusospirochetal Disease, Baltimore, Williams & Wilkins Company, 1932.

of pulmonary gangrene in mice, guinea-pigs and rabbits by intratracheal injection of sputum from a person having pulmonary spirochetosis. Such experimentally produced lesions of fusospirochetal gangrene resemble the spontaneous disease in man in gross characteristics as well as in bacteriologic and pathologic findings. Although previously considered as saprophytes, fusospirochetal organisms from the mouth are apparently the common cause of pulmonary gangrene in man.

Pulmonary gangrene is a distinct clinical entity and should not be confused with pulmonary abscess. Pyogenic organisms never produce gangrene, while the characteristic lesion produced by spirochetes, fusiform bacilli and vibrios is not abscess but gangrene. The problem of distinguishing between pulmonary gangrene and pulmonary abscess, in the face of their clinical, anatomic and roentgenologic resemblance, can be rendered less difficult by a careful study of the character and bacteriology of the sputum. In cases of abscess the sputum is mucopurulent or purulent and has no appreciable odor and the washed specimen will show pyogenic organisms in smears and cultures. The sputum of a person with gangrene, on the other hand, is foul-smelling, grayish brown or grayish green and when washed shows spirochetes, fusiform bacilli and vibrios in smears. The penetratingly foul odor emanating from the patient when he coughs is one of the characteristic clinical symptoms and should suggest the diagnosis of pulmonary gangrene even before the bacteriologic investigation of the sputum is undertaken. The presence in children of an associated oral lesion, usually dental caries or gingivitis, containing large numbers of oral spirochetes may be helpful in establishing the character of the pulmonary lesion when sputum is not obtainable. This finding is particularly significant in children below the age of 10 years, since their oral flora seldom includes spirochetes, fusiform bacilli and vibrios. In fact, the greater incidence of bronchiogenic abscess in children than in adults can be explained on the basis that the oral flora of children as a rule includes pyogenic organisms, mostly staphylococci, and not oral anaerobes. My associates and I observed the Miller-Vincent organisms (oral spirochetes, fusiform bacilli and vibrios) in smears taken from the interproximal spaces between the gums and the teeth in five of seven children with pulmonary gangrene.

It is of the utmost importance to distinguish between pulmonary abscess and pulmonary gangrene, since the treatment of these two conditions differs greatly. While the medical treatment of pulmonary abscess is mostly palliative, the intravenous administration of arsenic has been found in our experience to be a valuable therapeutic agent

in the treatment of pulmonary gangrene. That pulmonary gangrene is often confused with pulmonary abscess is indicated by a review of the literature. The total number of cases of pulmonary spirochetosis reported in the United States hardly reaches a few hundred (118 histories were collected by Smith [8] to November 1927), while in the various clinical services of the Mount Sinai Hospital alone we had 53 cases during the past ten years. Medical literature contains reports of only 63 instances of pulmonary spirochetosis in children, whereas our pediatric service alone has treated 7 patients with the disease. The discrepancy between the number of cases reported and the number that have come to our attention leads us to believe that there is a great deal of confusion regarding pulmonary abscess and pulmonary gangrene and that many of the cases reported as instances of pulmonary abscess on the basis of clinical and roentgenographic evidence not supplemented by a study of the sputum were in reality cases of pulmonary gangrene.

Much of the confusion has arisen from the lack of a proper classification of these diseases of the lung. In a recent paper Smith [9] advises the use of the word "abscess" in its descriptive pathologic sense, prefaced by the name of the specific etiologic agent, e. g., actinomycotic abscess, staphylococcic abscess and fusospirochetal abscess. Kline and Berger [10] stated that a distinction should be made between abscess, a suppurative process caused by pyogenic organisms, and gangrene, a more severe necrotizing lesion caused by Miller-Vincent organisms (oral spirochetes, fusiform bacilli and vibrios). The universal adoption of Kline's terminology would doubtless contribute much to the differentiation of these two distinct clinical entities, pyogenic abscess and fusospirochetal gangrene.

Since the oral flora of infants is practically free from spirochetes, fusiform bacilli and vibrios, one would not expect pulmonary gangrene to occur as frequently in children as in adults. However, as the age of the child increases, the oral flora begins to include fusospirochetal organisms, especially after dental caries or other lesions of the mouth and throat have developed. Furthermore, the numerous tonsillectomies and adenoidectomies performed on children greatly favor the aspiration of infective material from the oral cavity. That pulmonary gangrene in children is not uncommon has been demonstrated by Zinserling [11] in

9. Smith, D. T.: Diagnosis and Treatment of Pulmonary Abscess in Children, Tr. Sect. Pediat., A. M. A., 1934, p. 80; J. A. M. A. **103**:971 (Sept. 29) 1934.

10. Kline, B. S., and Berger, S. S.: Spirochetal Pulmonary Gangrene Treated with Arsphenamins, J. A. M. A. **85**:1452 (Nov. 7) 1925.

11. Zinserling, W. D.: Ueber die fuso-spirochaetische Gangraen und einige verwandte Prozesse verzugsweise bei Kindern, Jena, Gustav Fischer, 1928.

his treatise on fusospirochetal disease in children. In his investigation of that disease in the various children's hospitals of Leningrad during the postwar starvation period, he found that 14 per cent of his 89 patients had pulmonary involvement, while in 54 per cent the infection was localized in the mouth and in 25 per cent in the throat.

Cases of Miller-Vincent's infection of the lung have been studied carefully at the Mount Sinai Hospital for the past ten years. Fifty-five patients have been observed and a report summarizing the observations has recently been published.[12] Seven of the patients were children, and their histories form the basis of this report.

REPORT OF CASES

CASE 1.—C. L., a boy aged 8 years, was admitted to the hospital on April 21, 1925, with the complaint of high fever and a cough. The family and the past history were irrelevant. The present illness dated from a tonsillectomy performed two weeks previously. Four days after the operation a hacking cough developed, and there were pain in the chest and a progressive daily rise in temperature.

Physical Examination.—The patient appeared acutely ill and toxic. The temperature was 104.4 F., the pulse rate 160, and the respiratory rate 60. The respiration was rapid and grunting, with the alae nasi at play, and breathing was of the abdominal type. The pharynx was intensely red, and a number of decayed teeth were present. The right side of the chest was normal; the left had limited excursion, and percussion revealed a tympanitic note over the second and third ribs anteriorly as well as in the interscapular region. The rest of the left side of the chest was dull, approaching flatness at the base and axilla. Breath sounds were absent throughout this side of the chest except for the tympanitic areas, where amphoric breathing and crackling râles were heard. The heart was not displaced and the sounds were normal. The urine was normal, and the blood was normal except for leukocytosis, the white cell count being 28,000. Other findings were negative. The history of tonsillectomy coupled with the physical findings suggested the diagnosis of a pulmonary abscess that had ruptured into the pleural cavity. The roentgenographic examination made the same day showed the following condition: The heart was not displaced; the right side of the chest was normal; in the left side of the chest there was obliteration of the diaphragm and the costophrenic angle; there was cloudiness of this entire side of the chest, with the fluid level at the third rib anteriorly.

Course.—After a few days the patient began to expectorate a foul mucopurulent material which revealed innumerable gram-negative organisms, many slender spirochetes and a few fusiform bacilli. A thoracentesis yielded 110 cc. of foul-smelling, thin pus which contained innumerable oral spirochetes and a few fusiform bacilli as well as many gram-negative and positive organisms resembling the oral flora. Smears of material taken from the interproximal spaces between the teeth and the gums showed the presence of the same organisms.

12. Kline, B. S., and Berger, S. S.: Pulmonary Abscess and Pulmonary Gangrene, Arch. Int. Med. **56**:753 (Oct.) 1935.

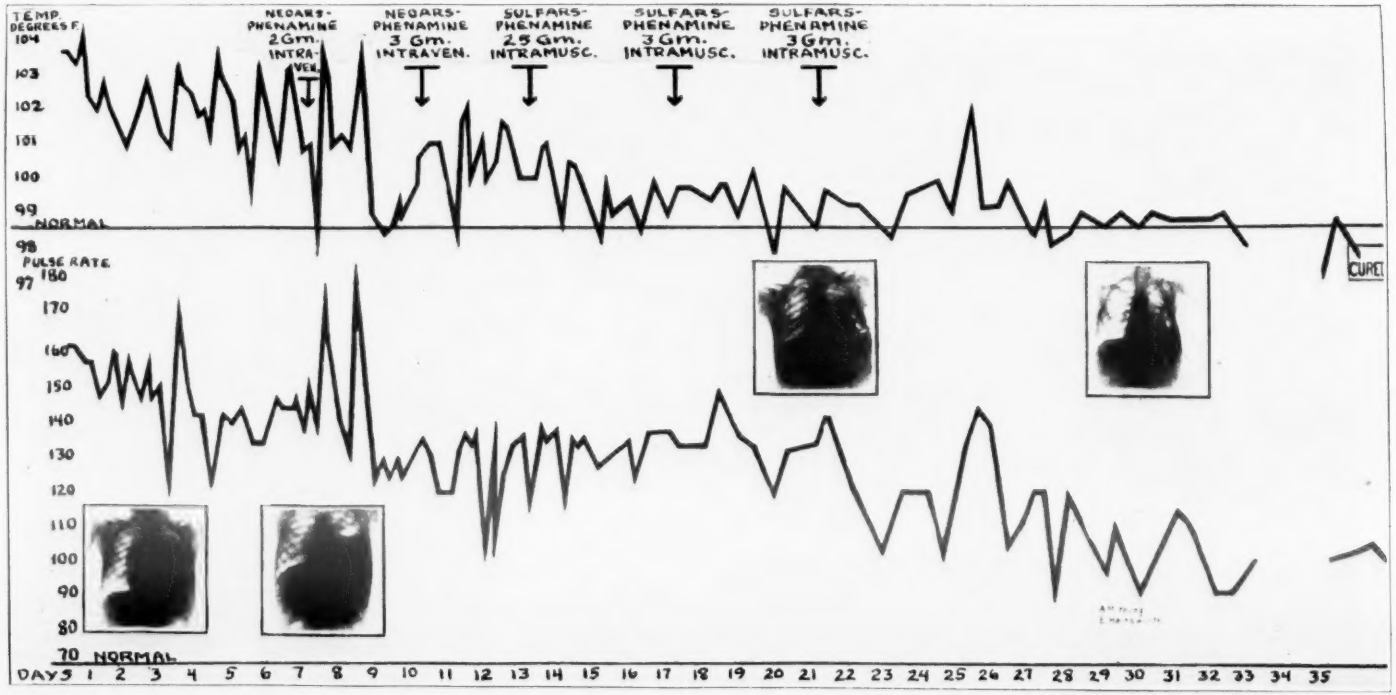

Fig. 1 (case 1).—Roentgenograms and chart showing clinical course and treatment.

Treatment.—Arsenic in the form of neoarsphenamine was administered intravenously every third day, at first 0.2 Gm. and later 0.3 Gm. A total of 1.7 Gm. was given. Simultaneously a wide thoracostomy was performed and drainage well established. The temperature, pulse rate and respiratory rate gradually returned

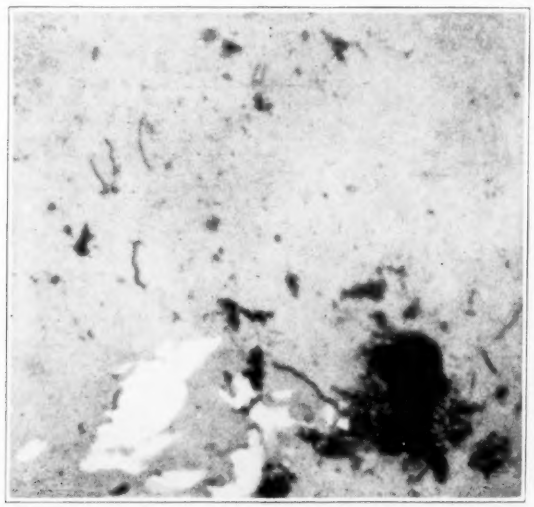

Fig. 2 (case 1).—Oral spirochetes from a carious tooth.

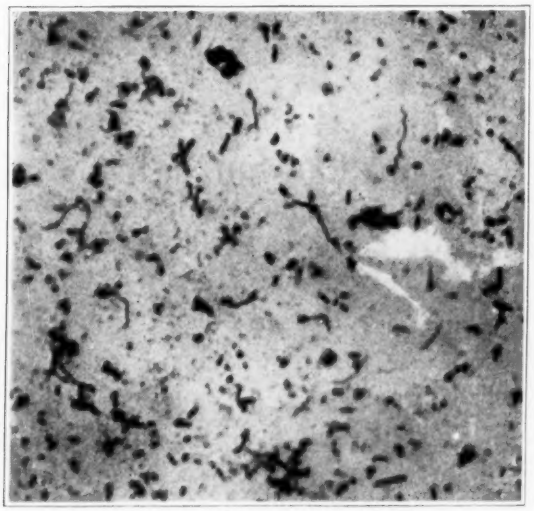

Fig. 3 (case 1).—Oral spirochetes from the pleural fluid.

to normal. The patient made an uneventful recovery and was discharged as cured after fifty-six days of hospitalization.

Case 2.—M. W., a boy aged 4 years, was admitted to the hospital on Nov. 25, 1927, with the complaint of a cough and fever. The family history and the past

history were irrelevant. The present illness dated from a tonsillectomy performed two weeks previously. A severe cough developed a few days before the patient's admission.

Physical Examination.—The patient appeared chronically ill and had a temperature of 100 F. The scant material coughed up had a penetratingly foul odor. There were hyperresonance and amphoric breathing over the region of the apex of the left lung. The heart was normal and not displaced. Other physical findings were negative. Smears of the washed sputum showed spirochetes, fusiform bacilli and vibrios. The white cell count was 11,000. The following day the temperature was normal, and the parents removed the child from the hospital.

A follow-up revealed that the patient suffered attacks of cough, fever and expectoration every four to six weeks. For over three years the child was given bronchoscopic treatment as an ambulatory patient. Since then he has been well except for an occasional cold. Physical examination made on Feb. 1, 1933, showed impaired resonance, with crepitant râles at the base of the left lung and in the left axilla. Roentgenographic examination showed that the hilar markings were increased on both sides and that there was considerable thickening along the bronchial tree at the bases. Several thick walls and cylindric bronchi were present at the base of the right lung close to the hilus. A diagnosis of bronchiectasis was made.

Owing to the lack of cooperation by the parents this patient received no arsenical treatment. Chronic bronchiectasis developed, and the child was treated privately for three years as an ambulatory patient. Further attempts to observe him failed.

Case 3.—Y. I., a girl aged 8 years, was admitted to the hospital on Feb. 12, 1928, with the complaint of swelling and pain about the face and jaw. Because of language difficulties it was not possible to obtain any family or past history. The present illness began four days previous to the patient's admission, when swelling of the face developed, with such severe pain that she could not open her mouth.

Physical Examination.—The patient appeared toxic and moribund. The breath was foul and the temperature 105 F. The left side of the head, especially the face, was red and edematous as far as the submandibular region. The child seemed unable to open her mouth more than 1 cm. The tongue was dry and coated; the teeth of the lower jaw were loose, and the gums appeared necrotic. The throat could not be seen, but there was a whitish membrane at the uvula. An indurated mass was palpated on the neck below the left mandible. The posterior cervical glands were hard and painful. The remainder of the physical examination showed nothing abnormal. Examination of the blood showed leukocytosis, the white cell count being 10,000. The diagnosis was Vincent's angina with suppurative adenitis.

An incision was made obliquely in the angle of the jaw, and about 2½ ounces (74 cc.) of thick pus was removed from the abscess cavity. Smears of the material from the mouth and of the pus from the jaw revealed many spirochetes, fusiform bacilli and vibrios as well as many of the cocci usually present in the mouth. Neoarsphenamine, 0.2 Gm., was administered intravenously every other day until four doses had been given. A few days later the child started to show signs of respiratory embarrassment. Physical examination showed dulness over the upper lobe of the right lung and scattered râles over the dull area. For the next few days there were increasing symptoms of involvement of the respira-

tory tract, with gradually increasing toxicity. A transfusion of 250 cc. of citrated blood improved the child's condition only temporarily. A roentgenogram taken three days later showed moderate cloudiness of the entire upper lobe of the right lung, especially marked in the intraclavicular region and along the lateral wall of the chest. The child suffered a number of severe hemorrhages from the mouth and died on the fourteenth day after admission.

Necropsy.—There was a recent surgical incision about 3 cm. in length above the lower angle of the mandible which communicated with the buccal cavity, and there was considerable edema of the face in this region. The mandible was extremely friable, portions of the bone being easily removed so that the unerupted permanent teeth could be lifted out. Smears of material taken from the lacerated margins of the gum and from deep in the necrotic foul-smelling bone showed innumerable spirochetes, fusiform bacilli and vibrios.

The lungs were found to be more voluminous than is normal. There was about 100 cc. of turbid, straw-colored fluid in the right pleural cavity, and tags of fibrin covered the pleura. The bronchi were markedly injected and filled with reddish-brown viscid material. The upper lobe of the right lung was dark reddish brown, and when incised it was found to contain several ragged, greenish cavities, the largest about 1.5 cm. in diameter. These were filled with greenish-brown, penetratingly foul-smelling exudate containing innumerable spirochetes, fusiform bacilli and vibrios. Certain areas suggested bronchopneumonia.

On microscopic examination several sections showed focal areas of necrosis and cavity formation in which large bacterial masses were present. Sections stained by the Warthin-Starry method showed these to be made up of fusiform bacilli, spirochetes and vibrios, the fusiform bacilli predominating. In one of the sections the gangrenous cavity involved the pleura, which was covered by a large amount of fibrin.

CASE 4.—L. G., a boy aged 8 years, was admitted to the hospital on Aug. 12, 1931, with the complaint of a slight cough, a tired feeling and a high fever for a few weeks. The family and the past history were irrelevant. The present illness dated from two weeks previous to admission, when an annoying cough developed but the patient was not ill enough to be confined to bed. A week later he had a high temperature and was seen three times by a physician not associated with the hospital, who made a diagnosis of pneumonia with probable effusion.

Physical Examination.—The patient appeared acutely ill and uncomfortable owing to dyspnea. The tonsils were large but not inflamed, and a few carious teeth were present. There were no alveolar abscesses, but there was mild gingivitis. When the patient coughed, his breath had a markedly foul, penetrating odor. The right side of the chest appeared fuller than normal, and the excursion was limited. The left side of the chest was normal. Percussion of the right side of the chest revealed a flat note from the upper part of the scapular region downward and extending anteriorly to the right axilla. On auscultation, diminished breath sounds at the right axilla and the base of the right lung were noted. A few crepitant râles were heard at the base of the right lung, and high-pitched and amphoric breathing was noted in the interscapular region. The heart was not displaced; the sounds were clear and the pulse was soft and rapid. The blood was normal except for a leukocyte count of 30,050. The rest of the physical examination revealed nothing abnormal. The roentgenographic examination made the same day showed the following conditions: There was cloudiness throughout the entire right side of the chest, with the lung markings visible only in the mesial half;

the inner half of the diaphragm was visible; dense, diffuse cloudiness appeared along the entire lateral wall of the chest; the left pulmonary field was clear. The impression given by the roentgenogram was that of an encapsulated empyema. The sputum was foul-smelling, viscid and greenish brown and contained innumerable gram-negative and gram-positive organisms and a moderate number of fusiform bacilli and spirochetes. A smear of material taken from the mouth showed the usual flora as well as a moderate number of fusiform bacilli and an occasional oral spirochete.

On the following day thoracentesis yielded a thin, turbid, foul-smelling fluid which on direct smear showed occasional degenerating pus cells and innumerable organisms, including many fusiform bacilli, small gram-negative bacilli and a moderate number of filiform bacilli but no spirochetes. Immediately after thoracentesis a wide thoracostomy was performed, and drainage and irrigation with surgical solution of chlorinated soda were instituted. Arsenical therapy was given on the day of admission. Neoarsphenamine was administered intravenously, at first 0.2 Gm. every other day and later 0.3 Gm. every third day. A total of 1.8 Gm. was given. The white cell count decreased rapidly to 15,000; the improvement was striking and steady, and the patient was discharged as cured after fifty-eight days of hospitalization. Eight months later he was in good health.

Case 5.—P. S., a boy aged 3 years, was admitted to the hospital on July 9, 1932, with the complaint of fever, a cough and expectoration. The past and the family history were not remarkable. The present illness started four weeks previously with a cough and mild fever. The cough was annoying, unproductive and brassy. A diagnosis of pneumonia of the right lung was made by a private physician. The patient was confined to bed for four weeks, with no abatement of symptoms, and was referred to the hospital for further study.

Physical Examination.—The patient seemed acutely ill and had a temperature of 103 F. The right diaphragmatic excursions were limited, and there were flatness and diminished breath sounds over the base of the right lung. The heart was normal and not displaced. The liver was palpable 1 fingerbreadth below the costal margin. The rest of the physical examination revealed nothing abnormal. The blood was normal except for a leukocyte count of 22,000. Roentgenographic examination showed that the heart was normal and that the right diaphragm and costophrenic angle were obliterated by diffuse density extending to the fourth interspace anteriorly and to the medial half of the base of the lung. Smears of material from the mouth and throat and of the washed sputum showed innumerable fusiform bacilli as well as the organisms usually present in the mouth, but no spirochetes.

The following day thoracentesis was performed, but no pus was obtained. During the next few days the patient became more toxic, and a transfusion of 250 cc. of citrated blood was given. During the next week the physical findings in the right side of the chest persisted. Another thoracentesis was performed with negative results, but a paroxysm of coughing following the thoracentesis resulted in the expectoration of thick mucopurulent material containing some elastic tissue. Smears of this material contained numerous oral organisms, including fusiform bacilli but no spirochetes. For the next few days the patient had a septic temperature. An attempt at an injection of iodized poppy-seed oil 40 per cent failed because of the persistent coughing. When the bronchoscope entered the right bronchus pus was revealed. No evidence of a foreign body was found. After the bronchoscopic examination the cough became so aggravated as actually to exhaust the patient, and another blood transfusion was given. The physical findings clearly

indicated pneumothorax of the upper lobe of the right lung, with a fluid level below. A roentgenogram confirmed these findings and also revealed many areas indicating either bronchiectasis or abscess cavities. Since the flatness over the base of the right lung increased, a thoracentesis was performed and a small amount of pus withdrawn. A rib resection was performed immediately and a drainage tube inserted. Although the drainage gradually stopped and the lung expanded, the patient still expectorated foul sputum and occasionally blood. Neoarsphenamine in doses of 0.15 Gm. every other day was administered intravenously but was discontinued when icterus developed. A total of 0.45 Gm. of arsenic was given. The patient's condition improved steadily, and he was discharged as cured after four months of hospitalization.

CASE 6.—P. P., a boy aged 8 years, was admitted to the hospital on Oct. 16, 1933, with the complaint of a cough and expectoration of foul-smelling sputum. The family history was irrelevant. The past history revealed that the patient was frequently troubled with various allergic manifestations, such as urticaria and angioneurotic edema. The present illness dated from October 6, when the patient

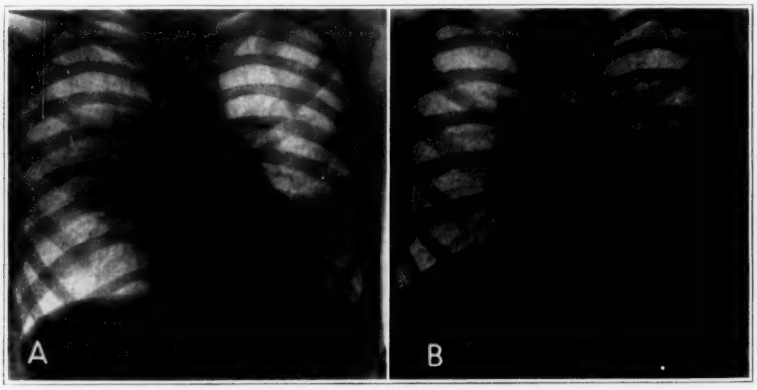

Fig. 4 (case 6).—*A*, first roentgenogram, showing dense pneumonic infiltration extending from the hilus of the right lung. *B*, second roentgenogram (six days after the first), showing lessened infiltration in the hilus of the right lung and dense pneumonic involvement of the entire lower lobe of the left lung.

underwent a tonsillectomy. Five days later a pain in the chest, a temperature of 103.6 F. and a cough developed. Two days later the patient began to expectorate sputum with a foul odor.

Physical Examination.—One immediately noted the extremely foul odor accompanying coughing. The mouth contained a few carious teeth, and there was a slight enlargement of the cervical nodes. The chest was symmetrical but moved somewhat more on the left. Posteriorly the percussion note was slightly higher pitched over the right infrascapular region. Many râles were heard at the base of the right lung. The heart was normal. The liver was palpable 2 fingerbreadths below the costal margin. Other physical findings were normal. Roentgenographic examination showed widespread infiltration in the hilus of the right lung, interspersed with indefinite areas of diminished density, suggesting necrosis, and fanlike, peritruncal infiltration extending into the pulmonary fields, but no definite confluent infiltration in the lateral portion of the right lung. The left lung was normal. Smears of the washed sputum and of material from the gums

and the throat showed many fusiform bacilli, vibrios and gram-negative filiform bacilli and a few faintly stained spirochetes. Examination of the blood showed a leukocyte count of 17,400.

Arsenical therapy was begun on the day of the patient's admission. Neoarsphenamine was administered intravenously every third day, beginning with 0.25 Gm., and the dose was gradually increased to 0.35 Gm. A total of 2.90 Gm. of arsenic was given. Postural drainage was instituted simultaneously. Three days later the physical signs of cavitation were found and were corroborated by roentgenogram. The patient progressed favorably as to cough, fever and odor of the sputum. At the end of the week a rise of temperature occurred. The cough was aggravated, and physical examination showed diminished excursion of the left side of the chest, dulness and numerous râles at the base. Roentgenographic examination showed that the infiltration in the hilus of the right lung had subsided considerably. There was dense cloudiness throughout the lower lobe of the left lung, with numerous small areas extending from the hilus into the upper portion of the lower lobe. In spite of the lowered temperature and the apparent improvement of the physical and roentgenographic findings in the base of the left lung, the patient was still annoyed by the cough and foul-smelling sputum. Attempts at injection of iodized poppy-seed oil 40 per cent and at bronchoscopic examination brought such opposition from the parents that they withdrew the child from the hospital. During the following few months the patient was seen at my office on several occasions, and physical and roentgenographic findings of a bronchiectasis were present. Further attempts to observe the case failed.

Case 7.—H. A., a girl aged 14, was admitted to the hospital on March 17, 1934, with the complaint of fever and pains in the joints for the previous two days. The family and the past history were negative.

Under treatment with salicylates the rheumatic manifestations disappeared, and the patient remained free from fever and comfortable. After ten days a tonsillectomy was performed. Four days after the operation the patient's temperature rose and a cough accompanied with foul-smelling sputum developed. Examination of the chest revealed nothing abnormal. The washed sputum showed, in addition to the organisms usually present in the mouth, occasional fusiform bacilli, vibrios and spirochetes. Roentgenographic examination showed a fairly dense, sharply limited shadow extending from the hilus of the left lung into the pulmonary field, suggesting a thickened pleura. The next week there were flatness and diminished breath sounds over the apex of the left lung, and a roentgenogram showed fairly dense infiltration extending from the upper hilar region along the course of the bronchi throughout the infraclavicular region to the lateral wall of the chest. Gradually the findings changed to those of cavity formation, and roentgenographic examination showed a well defined, fairly thick-walled ring shadow in the infraclavicular region. No fluid level was visible, and lung markings appeared to be visible within the ring shadow. Neoarsphenamine in doses of 0.35 Gm. every third day was administered intravenously five times. The condition of the lung healed steadily, and the patient was discharged as cured after sixty-nine days in the hospital.

COMMENT

The medical treatment of pulmonary gangrene may be classified under the following headings: general care, postural drainage, arsenical therapy and prophylaxis. General care indicates such care as will increase the comfort of the patient and thus increase his general

resistance and his chances for spontaneous recovery. It has been found that rest in bed and an abundance of easily digestible, nourishing food is as essential in this disease as it is in pulmonary tuberculosis. Free ventilation will greatly increase the comfort of the patient physically and psychologically as well as minimize the effect of the foul odor of the sputum. According to Smith,[8] in the acute state of pulmonary gangrene rest and postural drainage can be expected to give favorable results in from 14 to 25 per cent of the cases.

Postural drainage properly carried out is one of the most valuable aids in the treatment of pulmonary gangrene. Little expectoration can be promoted by mere elevation of the foot of the bed. Smith [8] advised placing the patient in a position exactly opposite to that in which he coughs least. A method of postural drainage which I have employed has proved effective in aiding the emptying of the cavity. Two chairs padded with pillows are placed side by side less than a foot (30.48 cm.) apart and close to and facing the side of the bed. The tops of the chairs should be about a foot lower than the level of the bed. The patient is placed at right angles to the direction of the bed, and the lower part of his body is supported prone on the bed. The upper part of his body hangs down from the bed, and his shoulders rest on the two chairs, his head being suspended between them. Such variations are introduced into the technic as are required for the patient's comfort.

The intravenous administration of arsenic in the form of neoarsphenamine pushed to the point of toxicity is, according to my experience, the most valuable single measure in the treatment of pulmonary gangrene. Kline and Berger,[13] reporting on a series of 39 cases in which there were demonstrable gangrenous cavitations, stated that of the 14 patients who received no arsenical therapy 3 recovered and 11 died. Of the patients who were treated, 17 recovered and 8 died. In Smith's [8] series of 13 cases, in which the diagnosis of pulmonary gangrene was made early, 12 patients recovered under arsenical treatment. Of the 7 patients observed at the Mount Sinai Hospital, 4 of the 6 who received arsenical treatment fully recovered, in 1 (case 6) chronic bronchiectasis developed and 1 (case 3) died. The patient who died entered the hospital in a moribund condition due to an overwhelming infection. In the patient who received no treatment (case 2) chronic bronchiectasis developed. Rib resection, drainage and arsenical treatment resulted in recovery in 3 cases (1, 4 and 5). It must be noted that in the adult group 2 of the 5 patients who underwent rib resection and drainage but received no arsenical therapy died. In contrast, only 1 patient died of 10 who underwent rib resection and drainage and

13. Kline, B. S., and Berger, S. S.: Pulmonary Abscess and Pulmonary Gangrene: Clinical Course and Pathology, Arch. Surg. **18**:481 (Jan., pt. 2) 1929.

received arsenical treatment. In cases in which thoracostomy is performed, arsenical therapy should in my opinion be continued not only as a therapeutic measure but also as an agent to prevent the possibility of a gangrenous cellulitis at the site of the thoracostomy.

Intravenous injection of arsenic is the method of choice. Arsenic injected intramuscularly is absorbed too slowly to be of therapeutic value against pulmonary gangrene. Direct injection into the gangrenous area, as recommended by Edel,[14] or into the bronchus, as proposed by Castex and his associates,[15] are difficult procedures and no more effective than intravenous injection. The arsphenamine is best administered in doses of 0.01 Gm. per kilogram of body weight every third day until the sputum has lost its odor and the physical signs have disappeared. Should toxic symptoms appear, such as itching of the skin, jaundice, gastro-intestinal upset or renal involvement, further arsenical treatment should be discontinued immediately.

Fusospirochetal pulmonary gangrene in children may to a large extent be prevented by suitable prophylactic measures. In a survey of 450,000 tonsillectomies in various institutions, Moore[16] found that pulmonary abscess or gangrene occurred in 1 of every 2,500 to 3,000 cases. It is to be noted that in 5 of the cases described the condition followed tonsillectomy, and in all 5 cases smears of material taken from the interproximal spaces between the teeth and the gums showed Miller-Vincent organisms. Apparently the anaerobes from the oral cavity were responsible for the gangrenous process in the lung. It is our opinion that since tonsillectomy is never an emergency operation it should not be performed until the mouth shows absence of infection. In cases in which such infection is demonstrated, the mouth should be cleaned up before tonsillectomy is performed.

SUMMARY

Seven cases of spirochetal pulmonary gangrene in children are reported.

Pulmonary gangrene is a distinct clinical entity and should not be confused with pulmonary abscess.

Infants practically never have gangrene, presumably because their mouths and throats do not harbor fusospirochetal anaerobes. The occurrence of pulmonary gangrene in older children is not uncommon, and their oral flora contains the Miller-Vincent organisms.

14. Edel, H.: Die Lokalbehandlung eitriger Lungenprozesse mit intrathorakalen Neosalvarsan Injektionen, Med. Klin. **25**:668 (April 26) 1929.

15. Castex, M. R.; Heidenreich, A. J., and Repette, R. L.: Arsphenamine, by Tracheal Route, in Treatment of Fetid Processes in Respiratory Apparatus, Bull. Acad. de méd., Paris **95**:131 (Feb. 9) 1926.

16. Moore, W. F.: Pulmonary Abscess, J. A. M. A. **78**:1279 (April 29) 1922.

Tonsillectomy and adenoidectomy predispose to aspiration of these organisms, and in many of the cases of pulmonary gangrene in children the condition follows such an operation (5 of the 7 cases in the series described).

Pulmonary gangrene should be suspected from the penetratingly foul odor of the breath, even before a bacteriologic study of the washed sputum is undertaken.

Arsenical therapy in the form of neoarsphenamine by the intravenous route is according to my experience the most valuable single measure for the treatment of pulmonary gangrene. The sooner the therapy is instituted, the greater the chances for complete recovery. Hence an early diagnosis is of the utmost importance, and a differential diagnosis from abscess is essential.

As pulmonary gangrene results from the aspiration of anaerobes from the oral cavity, the importance of proper oral hygiene is self-evident.

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Case Reports

GENERALIZED LIPOIDOSIS IN A CASE OF AMAUROTIC FAMILIAL IDIOCY

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Amaurotic familial idiocy, a well defined clinical and pathologic entity, is considered by most observers to be a disease resulting from a disturbance in the phospholipoid metabolism. In contrast, however, to Niemann-Pick's disease, in which there is a generalized lipoid histiocytosis, striking visceral changes have not been demonstrated in amaurotic familial idiocy. In the case to be described, though the condition was characteristic in all respects of the infantile type of amaurotic familial idiocy, the patient showed, in addition to the typical changes of the central nervous system deposits of lipoid in the visceral organs.

REPORT OF CASE

S. N., a Jewish boy aged 19 months, was admitted to the pediatric service of Dr. J. Sobel of the Hospital for Joint Diseases on Dec. 24, 1931, because of apathy, weakness and blindness. The baby had developed normally for the first five months of his life. He then became torpid and listless, moved little, slept a great deal and took less and less interest in his surroundings. He could not lift his head, and his grip was weak. At 8 months of age his vision seemed impaired; he had a vacant stare and did not follow objects with his eyes. Spasmodic movements of the arms were noted. Breathing was heavy and jerky, and he frothed at the mouth. There had been no frank convulsions. Birth had been spontaneous at full term, with an easy delivery. The baby was breast fed for nine months. The father and mother, who were first cousins, were living and well. A sibling, 5 years old, was living and well. There was no history of familial disease.

General and Neurologic Examinations.—The boy was large for his age and showed good skeletal development but flabby musculature. He was pale and stuporous but very responsive to touch and noise. Whitish mucoid matter discharged from the nose. The neck was not rigid. There were coarse rāles in the upper respiratory tract. There were splitting and roughening of the mitral and first pulmonic sounds. The abdomen and genitalia were normal. There was tapering of the fingers. The temperature was 99.2 F.; the pulse rate, 140, and the respiratory rate, 36.

From the Neuropathological Laboratory, Montefiore Hospital, and the Laboratory Division of the Hospital for Joint Diseases.

The head was round, large and heavy but of good conformation. The anterior fontanel was still open and very tense. The eyes rolled about slowly and aimlessly, and the scleras had a bluish tint. Examination of the fundi disclosed on the temporal side of each disk and somewhat inferior to it a fairly round grayish-white area about one-third the diameter of the disk, in the middle of which was a bright cherry-red spot about one-quarter the diameter of this area. The disks were somewhat atrophied. The reflexes were diminished, and there was a Babinski sign bilaterally.

Course.—Shortly after admission twitchings of the face and the upper extremities, convulsive seizures and spasticity appeared. The course was progressively downward, with the development of bronchopneumonia. Death occurred on Jan. 4, 1932.

Laboratory Data.—The urine was normal. Examination of the blood revealed the following: 50 per cent hemoglobin; 4,900,000 red cells; 20,900 white cells, with 59 per cent polymorphonuclear leukocytes, 40 per cent lymphocytes, 1 per cent monocytes, 2 per cent eosinophils, and hypochromia, polychromatophilia and toxic granules. The sedimentation rate was 20 mm. in one hour. The urea nitrogen content was 14.8 mg. per hundred cubic centimeters; the creatinin content, 1.1 mg.; the uric acid content, 2 mg.; the sugar content, 91 mg.; the cholesterol content, 174 mg.; the calcium content, 10.8 mg., and the phosphorus content, 5. The Wassermann reaction of the blood was negative.

Roentgen examination of the skull revealed extreme thinning of the cranial bones, associated with an open anterior fontanel. The proximal thirds of both ulnas showed slight cancellous expansions, the cortex being slightly thinned. Roentgen examination of the spine and lower extremities showed no abnormality.

Gross Examination of the Organs.—The body was that of a white boy, well nourished and presenting no abnormalities of the skin or of the upper and lower extremities. The teeth were retarded in their development. There was no swelling or edema. Approximately ½ inch (1.2 cm.) of fat was present subcutaneously. The muscles and heart were of normal size, shape and color. The anterior or aortic leaflet of the mitral valve presented two yellowish plaques, each the size of two pinheads. The right lung disclosed evidences of a bronchopneumonic process. The liver extended 1 fingerbreadth below the right costal margin. The capsule was smooth. On section the liver presented a normal color and configuration. The spleen was atrophic, and on section no abnormalities were noted. All the other organs were normal. The thymus was small and atrophic, approximately one-half the normal size. Section of the thymus showed severe involutional atrophy. There was marked thinning of the calvarium, with marked protrusion of the right frontal bone.

Microscopic Examination of the Organs.—In the spleen there was lipoid material collected in large granular cells within the center of the malpighian corpuscles (fig. 1). Degenerated cells were also observed. There was considerable disappearance of the lymphoid cells of the spleen. Many of the liver cells were devoid of cytoplasm; many were completely disintegrated, and others contained large vacuoles (fig. 2). With the sudan IV stain definite islands of liver cells with fatty deposits were seen (fig. 2). Large cells containing lipoid were also noted. Many of the convoluted tubules of the kidney were clear, and others were completely disintegrated. Occasionally a large cell with clear cytoplasm belonging to the fat cells was observed.

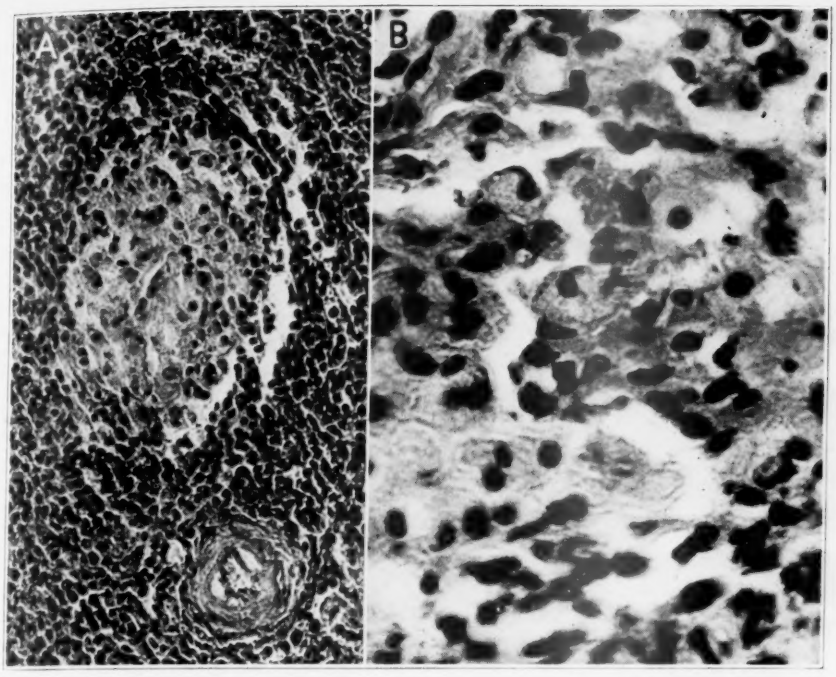

Fig. 1.—Photomicrographs of section of the spleen. *A* shows large foamy reticular cells within the malpighian corpuscles. Notice also degenerated cells. Hematoxylin and eosin stain; magnification, × 200. *B* shows the foamy reticular and degenerated cells in the malpighian corpuscles. Hematoxylin and eosin stain; magnification, × 400.

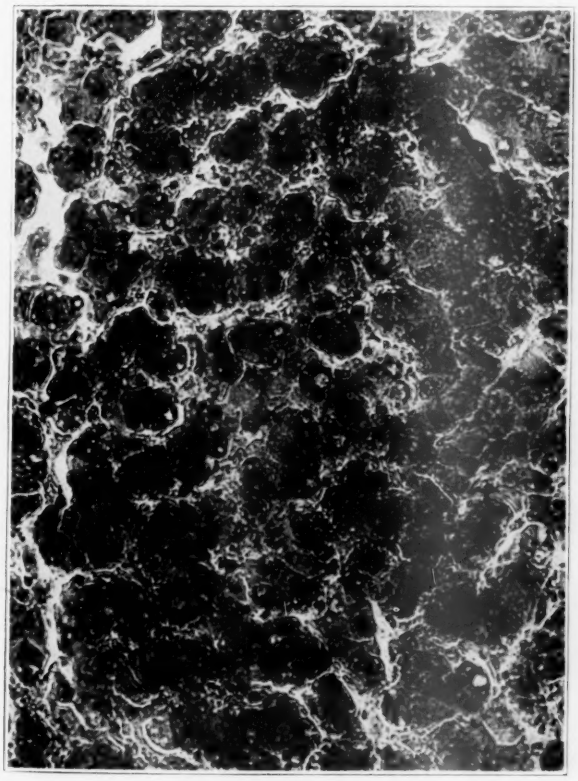

Fig. 2.—Photomicrograph showing disintegration of many of the liver cells containing deposits of lipoid and vacuoles. Sudan IV stain; magnification, × 240.

Gross Examination of the Brain.—The vessels of the cerebral hemispheres were injected, and the pia-arachnoid over the cerebellum had a copper color. There were subarachnoid hemorrhages over the central and parietal areas. The left hemisphere appeared somewhat larger than the right. The brain was firm in consistency, and the occipital convolutions were atrophied. The brain was cut coronally. The neostriatum was larger than normal. The left lateral ventricle was slightly constricted. The cortical laminations could not be well visualized.

Microscopic Examination of the Brain.—Complete coronal sections through the mamillary bodies, red nucleus, cerebellum and medulla oblongata were stained by the cresyl violet and myelin sheath methods. Small sections from various convolutions and from the dentate nucleus, cerebellum and spinal cord were

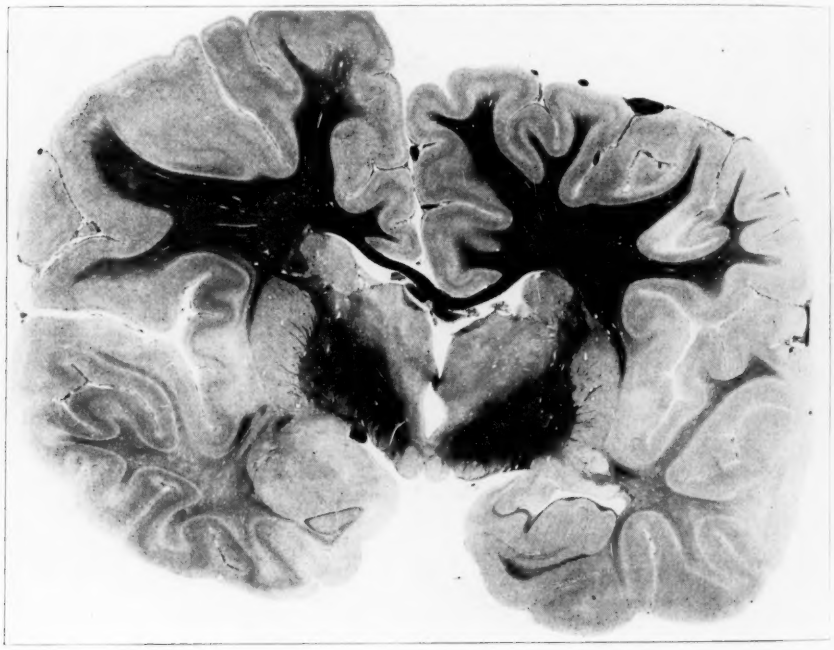

Fig. 3.—Photomicrograph of transverse section through the mamillary bodies. The white fibers of the temporal lobes and hippocampus are not myelinated. Notice also the shrinkage of the internal capsule and the absence of the mamillothalamic bundle.

stained by the myelin sheath, cresyl violet, sudan III and Bielschowsky methods and by the del Rio Hortega method for staining microglia (Penfield's modification). The optic nerves were stained by the myelin sheath and Van Gieson methods.

Coronal Section Through the Mamillary Bodies: The left hemisphere was larger than the right. The fiber tracts in the centrum ovale took the myelin sheath stain poorly (fig. 3). The myelin sheaths of the temporal, hippocampal and fusiform convolutions barely stained at all. The internal and external capsule and most of the pallidal fibers stained poorly. The fibers of the corpus callosum, the fasciculus lenticularis, the fibers between the segments of the globus pallidus and the fibers of the hippocampus took the myelin sheath stain well.

Coronal Section Through the Red Nucleus: The left hemisphere was larger than the right. There was poverty of myelin throughout, which was most noticeable in the temporal convolutions (fig. 4). The corpus callosum, although thinned, stained more deeply. The same was true of the capsular fibers of the red nucleus. The thalamic and striatal fibers stained poorly. With high power magnification the poorly stained fibers showed little or no myelin; other fibers showed broken-down myelin. Many of the myelin droplets took a deep stain. The single fibers were few in number and appeared disintegrated. The cortical zones of the temporal convolutions contained hardly any myelinated fibers. There was, therefore, a twofold disturbance in the myelin sheaths: (1) lack of development and (2) degeneration. Total absence or lack of development was the outstanding picture. In the cresyl violet preparations the pia-arachnoid was slightly thickened and con-

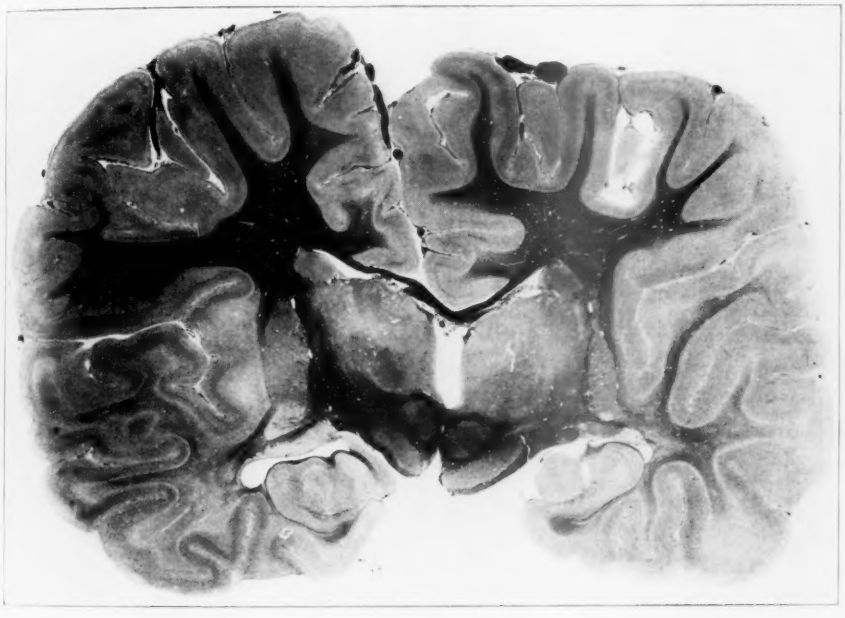

Fig. 4.—Photomicrograph of section through the red nucleus. Notice the absence of myelin in the white matter of the temporal lobes and hippocampus and the shrinkage of the internal capsule and of the cerebral peduncles. Myelin sheath stain.

sisted of proliferated and swollen arachnoid cells. The cortical layers stained uniformly, but the laminations were not as clear as those seen in the normal brain at this age. The fasciculus dentatus of the hippocampus, which generally takes a deep blue stain with cresyl violet, stained poorly. Under higher magnification only the first and second cortical zones of the cortical layers could be identified; the third, fourth, fifth and sixth layers seemed to merge one into the other. The small and large ganglion cells of the cortex were all extremely swollen, fusiform or balloon-shaped (fig. 5). The cytoplasm stained poorly; the nuclei were eccentric, staining slightly more deeply than the cytoplasm of the nerve cells, and the nucleoli took a deep stain. All the nerve cells were oval, and in many the proc-

esses could not be identified. Most of the nerve cells had a reticular or honeycombed appearance (fig. 5); some were vacuolated. Most of the cells were poor in Nissl substance, which under higher magnification was seen to consist of fine granules (fig. 5). Washed-out nerve cells were also seen. Some of the large pyramidal cells, although poor in cytoplasm, maintained their shape; others had a honeycombed appearance. Most of the pyramidal cells of Betz were only partially diseased, and the Nissl granules were collected at the periphery of the cell.

Fig. 5.—Photomicrograph showing swelling, fusiform and balloon-shaped appearance of the nerve cells of the cortex. Their cytoplasm stains poorly, giving them a granular and reticular appearance; their nuclei are displaced toward the periphery, and their nucleoli stain deeply. Cresyl violet stain; magnification, × 900.

Peculiar forms of swollen ganglion cells were seen in the motor area. The glia cells, predominantly the microglia cells, were increased in number, most noticeably in the marginal zone. They were swollen, and except for the absence of the nucleoli it was difficult to differentiate them from ganglion cells. Numerous *gemästete* glia cells were also present in the marginal zone. Some of the endo-

thelial cells of the blood vessels were also swollen. In the white matter the glia cells (astrocytes and *gemästete* glia cells) were increased in number. The ganglion cells of the temporal and hippocampal lobes appeared more swollen than those of the other convolutions. In the occipital lobe many of the large nerve cells retained their shape but had little cytoplasm. There were many compound granular corpuscles with mitotic figures in the occipital convolutions. The nerve cells of all the other convolutions, as well as those of the gray nuclear masses (the thalamus, striatum and pallidum, red nucleus, substantia nigra, hypothalamic nuclei, amygdaloid nucleus and mamillary bodies) showed the same pathologic changes. In the Bielschowsky preparation the cortex, especially in the fourth, fifth and sixth layers, had a honeycombed appearance; this was due to the swelling of the nerve

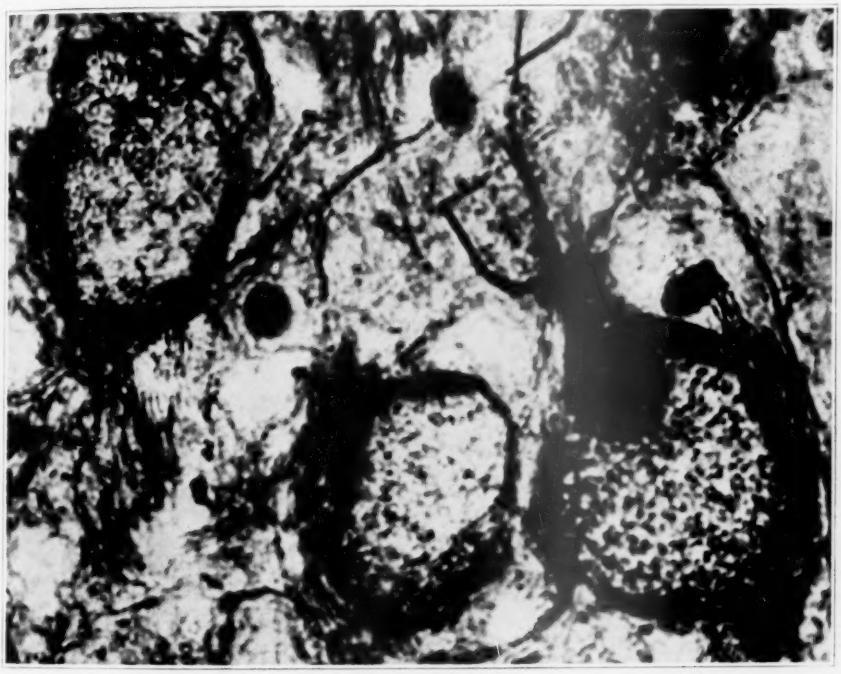

Fig. 6.—Photomicrograph of section of the cortex, showing swelling of the ganglion cells, collection of the neurofibrillae at the periphery of the cells and in the axonal processes and the reticular appearance of the cytoplasm containing coarse silver granules. Bielschowsky stain; magnification, × 960.

cells which were devoid of Nissl substance. Most of the ganglion cells of the cortex showed the same changes as with the cresyl violet stain, with the difference that the reticular appearance of the cells was brought out more clearly (fig. 6). Most of the fibrillae, especially those near the nuclei, had disappeared; those remaining were in the axonal processes or near the dendrites and at the periphery of the nerve cell (fig. 6). Breaking down and swelling of the axis-cylinders within the cortical gray and white matter were also observed. Some of the nerve cells, instead of having the reticular formation as seen with the cresyl violet stain, merely showed coarse deposits of argentophilic granules. Disappearance of the

fibrillae was also observed in many of the axonal processes of the nerve cells. In many cortical sections stained by this method numerous giant astrocytes with protoplasmic processes or swollen microglia were observed in the second and third layers (fig. 7). In the parietal gyrus there was an increase in the glia cells, particularly the large fibrillary astrocytes. These replaced destroyed cortical tissue, mainly in the third, fourth, fifth and sixth layers. The increase in glia was of both the progressive and the regressive form, as indicated by astrocytes, compound granular corpuscles, microglial proliferation and monster glia cells. The axis-

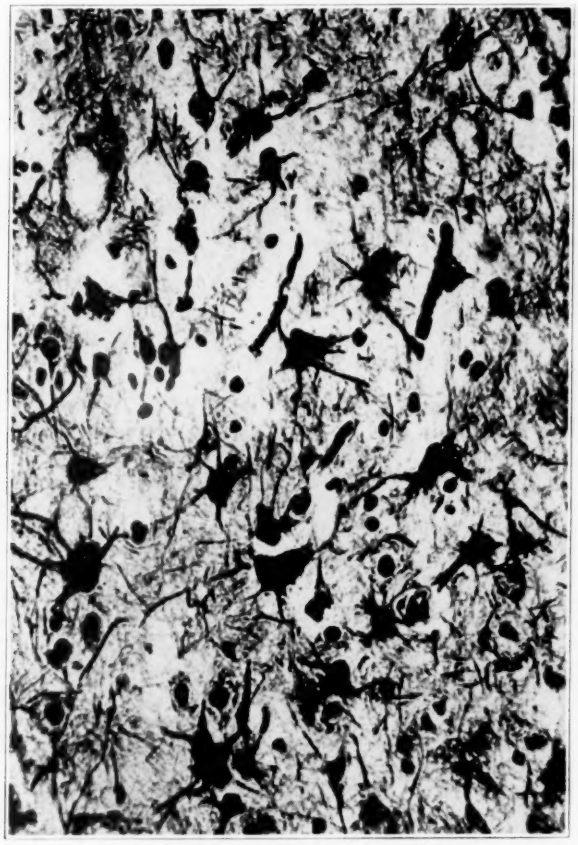

Fig. 7.—Photomicrograph of section of the cortex, showing increase in the number and size of the glia cells (astrocytes and microglia) replacing the destroyed cortical cells in the third, fourth, fifth and sixth laminae. Bielschowsky stain; magnification, × 240.

cylinders in the white matter were beaded. The cortical vessels, especially those of the white matter, showed widening of the perivascular spaces. In the section stained by the sudan III method the ganglion cells had the same appearance as those described in the cresyl violet preparations. Many did not show any distinct deposits of fat; others had the reticular cytoplasm filled with fine fatty granules,

but droplets of fat were rarely seen. The swollen ganglion cells which appeared as shadow cells were stained pale rose (fig. 8). The microglia cells about these nerve cells were increased in number and took a more reddish stain when treated by the sudan III method (fig. 8). The compound granular corpuscles were also better visualized with this stain. Some of the astrocytes and swollen oligodendroglia cells contained fatty deposits. The lipoid granules in the astrocytes were best seen in sections of the caudate nucleus. Large fatty deposits were seen about the vessels, especially in those of the white matter (fig. 9). With the Bielschowsky, Cajal, del Rio Hortega and sudan III stains the same changes in the nerve cells

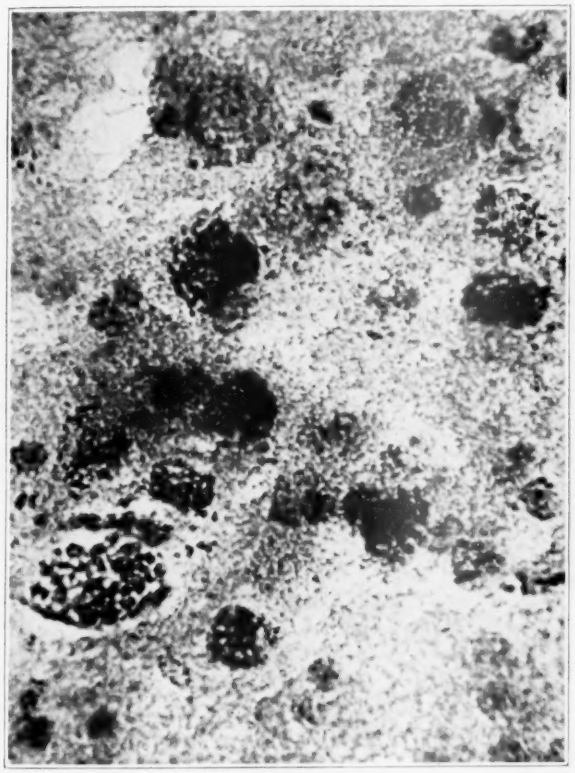

Fig. 8.—Photomicrograph of section of the cortex, showing swollen ganglion cells, some of which appear as shadow cells, while others contain deposits of lipoid. The glia cells are rich in deposits of lipoid. Sudan IV stain; magnification, × 480.

and glia cells were observed in the gray nuclear masses as in the cortex. In the pallidum and in the tuber cinereum many of the vessels contained deposits of calcium.

Section of the Pons Through the Fourth Ventricle and the Seventh Nerve Nucleus: All the fibers stained poorly except the brachium conjunctivum, which was diminished in size. The ganglion cells of the locus caeruleus were intensely swollen and had lost their iron pigment.

Section of the Cerebellum and Medulla Oblongata Through the Fourth Ventricle: The left part of the cerebellum appeared smaller than the right. The cerebellar fibers stained poorly (fig. 10). The only fibers which stood out prominently were those of the brachium conjunctivum and corpus restiforme (fig. 10). The brachium pontis, although it stained poorly, took the myelin sheath stain better than the other fibers of the cerebellum. The lemnisci and the pyramids,

Fig. 9.—Photomicrograph of section of the cortex, showing fatty deposits in the white matter and slight disintegration of myelin. Sudan III stain; magnification, × 240.

the tractus thalamo-olivaris and the other pathways of the medulla oblongata also stained poorly (fig. 10). The olives appeared hypertrophied (fig. 10). With higher power magnification the pathologic changes appeared to be the same as those observed in the cortex, i. e., poverty of myelin and occasional disintegration of myelin sheaths. Within many of the arbores vitae no myelin could be seen.

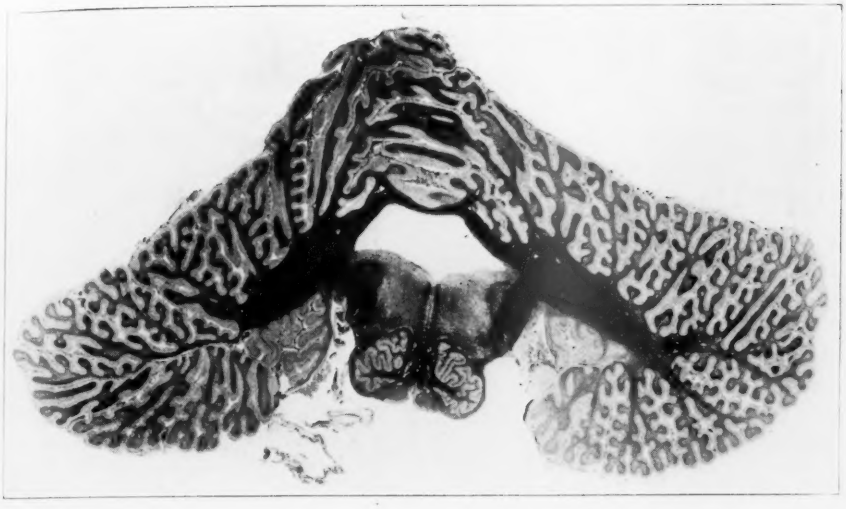

Fig. 10.—Photomicrograph of section through the fourth ventricle, showing the pyramids and lemnisci of the medulla oblongata poorly stained. The white matter of the cerebellum is myelinated but not as well as that seen in the normal brain. The olives appear hypertrophied. Myelin sheath stain.

Fig. 11.—Purkinje cells of the cerebellum. Notice the swelling, the reticular appearance of the cytoplasm and the prominent nuclei near the axonal hillock. Bielschowsky stain; magnification, × 200.

The granular layer of the cerebellum took a lighter stain, and the molecular layer was shrunken. In the sections stained with cresyl violet the Purkinje cells were markedly diseased, hardly a healthy cell being present. These cells were intensely swollen, with complete loss in Nissl substance; their cytoplasm had a reticular appearance, and their deeply stained nuclei were located at the periphery (fig. 11). Some Purkinje cells retained part of the chromatin material. Their axons were swollen. In the sections stained by the Bielschowsky method the Purkinje cells

Fig. 12.—Purkinje cells. Notice the loss in the neurofibrillae in the nerve cell, the deeply stained and prominent nucleolus and the swelling of the axons and of the dendrites. Bielschowsky stain; magnification, × 600.

contained monstrous pale swellings of the dendrites; in the pale parts the fibrillary processes disappeared (fig. 12). The glia cells of all varieties were increased in number and hypertrophied. In the sections stained by the sudan III method the changes were similar to those in the cortex.

The ganglion cells of the dentate nucleus and those of the olives and of the cranial nerve nuclei in the medulla oblongata were also swollen and differed little in their pathologic features from the other cells.

Microscopic Examination of the Optic Nerves.—The myelin was poorly developed and disintegrated. The ganglion cells of both retinas were swollen; some were atrophied.

Microscopic Examination of the Spinal Cord.—All the fiber tracts except the posterior columns took the myelin stain poorly. With higher power magnification

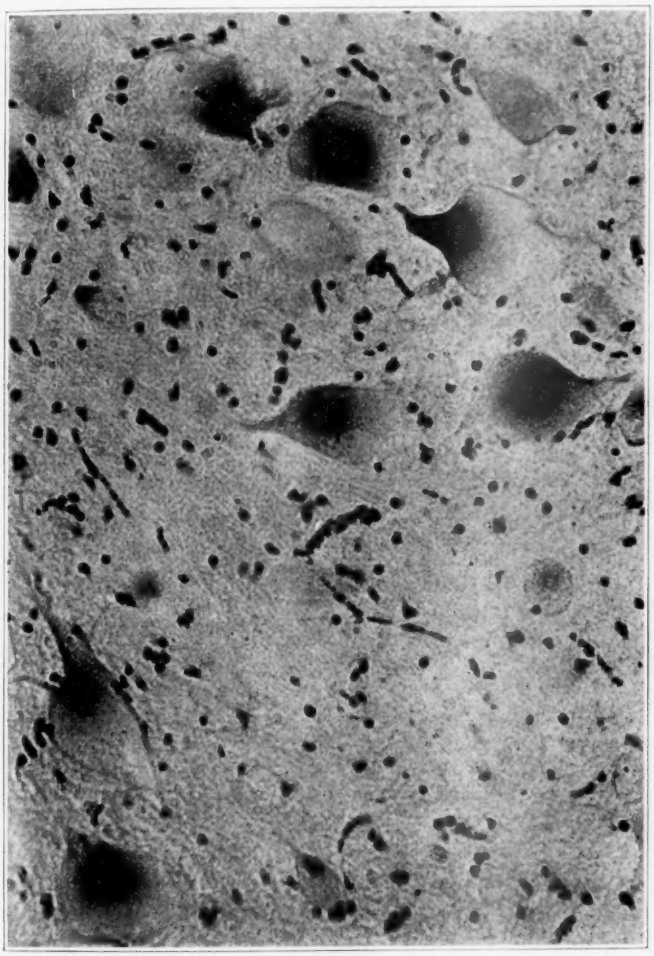

Fig. 13.—Photomicrograph showing marked swelling of the anterior horn cells of the spinal cord. Cresyl violet stain; magnification, × 240.

the same changes were seen as in the sections of the cortex or medulla oblongata. With the cresyl violet stain the ganglion cells of the cord showed marked swelling, a reticular or honeycombed appearance, loss of Nissl substance and peripherally displaced nuclei (fig. 13). With the Bielschowsky stain the fibrillae were lost except in the region of the axons and dendrites.

Anatomic Diagnosis.—The condition was diagnosed as amaurotic familial idiocy of the infantile type, with lipoid histiocytosis in the visceral organs as well as in the central nervous system, and bronchopneumonia.

Summary of Case.—The clinical aspects of the disease conformed to the general picture observed in infantile amaurotic familial idiocy. Histopathologically, there was marked swelling of the nerve cells and their processes throughout the central nervous system. In the white matter there were disintegration and lack of myelinization in the hippocampal, fusiform and temporal convolutions and in the cerebellum, breaking down of axis-cylinders and intense gliosis in the cortex and in the white matter. The absence or poverty of myelinization in the white matter of the convolutions just enumerated deserves consideration. With the exception of the white matter in the second and third temporal convolutions, which may not be fully myelinated until eight months after birth, the fibers of the other convolutions that belong to the primary and intermediary myelogenetic zones of Flechsig should be myelinated one month after birth. Of unusual interest were the foam cells in the spleen and the fatty deposits in the liver and kidneys.

COMMENT

The recent discovery that some patients with Niemann-Pick's disease, in addition to the histiocytosis of most organs, show pathologic changes in the central nervous system similar to those seen in amaurotic familial idiocy has thrown new light on the pathogenesis of these two diseases. As a result of this discovery a complete revision of the understanding of the underlying cause of amaurotic familial idiocy has taken place. A number of investigators (Bielschowsky,[1] Sachs,[2] Marinesco,[3] Spielmeyer,[4] Kufs[5] and others) have come to the conclusion that the generalized lipoid histiocytosis in all the organs, especially the liver, spleen and lymph nodes, and in the central nervous system seen in Niemann-Pick's disease is due to a disturbed lipoid metabolism which causes an abnormal accumulation and distribution of lipoid in the cells. The swelling and the other histologic changes are considered to be

1. Bielschowsky, M.: Amaurotische Idiotie und lipoidzellige Splenohepatomegalie, J. f. Psychol. u. Neurol. **36**:103, 1928.

2. Sachs, B.: Amaurotic Family Idiocy and General Lipoid Degeneration, Arch. Neurol. & Psychiat. **21**:247 (Feb.) 1929.

3. Marinesco, G.: Nouvelles recherches sur la forme de Spielmeyer-Vogt de l'idiotie amaurotique et son mécanisme biochimique, Encéphale **22**:605, 1927.

4. Spielmeyer, W.: Störungen des Lipoidstoffwechsels bei Erbkrankheiten des Nervensystems (am Beispiel der familiären amaurotischen Idiotie), Klin. Wchnschr. **33**:1273, 1933.

5. Kufs, H.: Ueber einen Fall von Spätform der amaurotischen Idiotie mit atypischen Verlauf und mit terminalen schweren Störungen des Fettstoffwechsels im Gesamtorganismus, Ztschr. f. d. ges. Neurol. u. Psychiat. **122**:394, 1929; Sind die lipoidzellige Splenohepatomegalie (Typus Niemann-Pick) und die amaurotische Idiotie einander koordiniert und sind beide nur Teilerscheinungen einer konstitutionellen Lipoidstoffwechselstörung des ganzen Organismus? ibid. **145**:565, 1933.

secondary to the accumulation of lipoid in the cell. Schaffer,[6] who has contributed extensively to the knowledge of this subject, still insists that amaurotic familial idiocy and generalized lipoid histiocytosis are not produced by the same causative factor. Furthermore, he considers the swelling of the ganglion cell to be the result of decomposition of the hyaloplasm (the undifferentiated part of the cellular cytoplasm) into its basic elements of proteins and lipoids.

The associated visceral and neural changes in Niemann-Pick's disease are perhaps not sufficient to establish the close relationship of this condition to amaurotic familial idiocy. The histopathologic changes in the visceral organs in clearcut cases of amaurotic familial idiocy strongly suggest that the two diseases are closely related and that they are caused by a common etiologic factor.

Thus far there are only two cases of amaurotic familial idiocy on record in which the neural changes were associated with deposits of lipoid in the visceral organs. Kufs first described this picture, as observed in a patient 36 years of age, in whom the disease started at the age of 26 and continued until the age of 38, when the patient died. The brain showed the typical changes of amaurotic familial idiocy. The adrenal glands, kidneys, lymphoid organs, thyroid gland, hypophysis, liver and heart contained fatty deposits. The characteristic splenohepatomegaly encountered in Niemann-Pick's disease was absent in this case. In the spleen the deposits of lipoid in the form of droplets of fat, which were observed in the other organs, were limited to the cells of the walls of the blood vessels and to the trabeculae. Foam cells were absent in the spleen but were present in abundance in the lymph nodes. Kufs expressed the opinion that splenohepatomegaly does not occur in the late forms of amaurotic familial idiocy. Of greatest importance in this case was the histochemical demonstration of the same type of lipoids in the nerve cells as in the cells of the other organs; in all these the sudan III and scarlet red stains brought out the fat.

Böhmig and Schob [7] observed changes in the spleen and lymph nodes like those seen in Niemann-Pick's disease in a case of juvenile familial idiocy in a non-Jewish child. The other organs were poorly preserved, and these investigators could not demonstrate deposits of lipoid. The spleen was enlarged. They succeeded in demonstrating that the foam cells had microchemical reactions similar to those in the nerve cells.

6. Schaffer, K.: Sind die familiär-amaurotische Idiotie (Tay-Sachs) und die Splenohepatomegalie (Niemann-Pick) in ihrer Pathogenese identisch? Arch. f. Psychiat. **89**:814, 1930.

7. Böhmig and Schob, cited by Schob, F., in Bumke, O.: Handbuch der Geisteskrankheiten: Die Anatomie der Psychosen, Berlin, Julius Springer, 1930, vol. 11, pt. 7, p. 977.

They were, however, unable to observe fatty deposits in the mesodermal elements of the central nervous system, as Bielschowsky did in his case.

Our case of infantile amaurotic idiocy completes the proof that neural and visceral changes are present in all types of amaurotic familial idiocy, that is, the late, the juvenile and the infantile type. In our case, as in Kufs', the spleen was not enlarged, but, in contrast to the spleen in Kufs' case, it contained foam cells in the malpighian corpuscles. In the liver and kidneys there were extensive lipoid deposits without foam cells.

These observations demonstrate conclusively that one is dealing in these cases not with accidental visceral and neural changes but with the end-result of a common pathologic factor. Pick stated the belief that in this disease there is a primary disturbance of the lipoid metabolism, in which the phosphatides invade the blood stream. Because of their excessive amounts the phosphatides become deposited at first in the histiocytic apparatus of the body and later in the parenchyma of the liver and kidneys, in the intestinal epithelium, in the muscles of the heart, in the papillae of the tongue and in other organs. This view seems acceptable as the explanation of our observations and of those of Kufs and of Böhmig and Schob.

CONCLUSIONS

A case of classic infantile familial idiocy is reported. In addition to the deposits of lipoids and the characteristic changes in the nervous system, fatty deposits were demonstrated in the spleen, liver and kidneys.

The neural and visceral changes in our case and in the cases recorded in the literature, as well as the associated neural changes noted in Niemann-Pick's disease, suggest strongly that the disease process is due to a common pathogenic factor, a disturbance in the metabolism of the phosphatides and neutral fat.

PNEUMOTHORAX OF THE NEW-BORN

REPORT OF A THIRD CASE OF THE INFECTIOUS TYPE, WITH COMMENTS ON PATHOGENESIS OF THIS TYPE

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DECATUR, ILL.

The following case of infectious pneumothorax in a new-born infant is reported both because of the rarity of the disease and because of the pathologic demonstration of the etiologic basis of the condition in this instance. The first case of pneumothorax of this type in a new-born infant was reported by Gasul and Singer.[1] After reviewing the literature, Glaser and Landau[2] recently reported the second instance of infectious pneumothorax in a new-born infant, thereby making a total of seventeen authentic cases recorded of pneumothorax of all types in the new-born. Subsequently, Folke,[3] who included two cases cited by Miller[4] and not recorded by the previous authors, reported the case of a 17 month old boy with persistent pneumothorax which developed soon after a normal delivery. The probable etiology was given as a valve mechanism superimposed on congenital small cysts of the lungs. It is possible that failure to record cases may magnify the apparent rarity of early pneumothorax, for the present case was observed several years ago and is reported at this time primarily because of its striking similarities to the other recorded cases of the infectious type of the disease. The points of resemblance are tabulated briefly in the accompanying table.

The clinical diagnosis of pneumothorax in early life is generally referred to as difficult or impossible without roentgen examination. While this may well hold true immediately or early after birth, patients with the infectious type of the disease should reveal pathognomonic signs sufficient for clinical diagnosis. The uniform failure of symptomatic and supporting treatment in these cases suggests that pneumo-

1. Gasul, B. M., and Singer, H. A.: Spontaneous Pneumothorax in the New-Born, Am. J. Dis. Child. **45**:1050 (May) 1933.

2. Glaser, J., and Landau, D. B.: Pneumothorax of the New-Born, Am. J. Dis. Child. **50**:986 (Oct.) 1935.

3. Folke, L.: Persistent Spontaneous Pneumothorax in Infants, Acta pædiat. **17**:426, 1935.

4. Miller, R. T., Jr.: Congenital Cystic Lung, Arch. Surg. **12**:392 (Jan., pt. 2) 1926.

thorax was incidental to progressive infection apparently insuperable at the early age of the patients. The possible evolution and suggested source of such infection are illustrated by the following case.

REPORT OF CASE

M. S., a boy weighing 7 pounds and 10 ounces (3,458.63 Gm.), was delivered normally at term on May 5, 1929. Mucus was cleared from his throat, according to routine, by tracheal catheter. The mother, a primipara aged 32 years, was healthy. Pregnancy had been uneventful, and the family history was irrelevant.

Irregular vomiting occurred between the second and the fifth day, when bottle feedings were offered to complement an insufficient supply of breast milk. When the baby was first seen, at the age of 5 days, he appeared healthy save for vomiting, apparently of a mechanical type. A moderate degree of physiologic jaundice was present. He had lost a total of 12½ ounces (354.39 Gm.). His progress was uneventful under supervision of feedings, and he was discharged on the

Recorded Cases of Infectious Pneumothorax in New-Born Infants

Case	Author	Delivery	Sex	Circumcision	Onset, Age in Days	Side	Type	Died, Age in Days	Etiology
1	Gasul and Singer [1]	Normal	M	....	21	R	Tension	24	Rupture of abscess of lung
2	Glaser and Landau [2]	Normal	M	Yes	21	L	Tension	25	Rupture of abscess of lung; culture, staphylococci
3	Wilkinson	Normal	M	Yes	17	R	Tension	30	Septic infarcts of lungs; rupture of secondary abscess; culture, staphylococci

twelfth day, weighing 1 ounce (28.34 Gm.) more than at birth. Circumcision was performed the day before his discharge.

At 10 p. m. on May 22, 1929, five days after leaving the hospital, the baby was seen because of fever, rapid breathing and refusal of feedings starting that day. The mother said that he had had some evidences of a cold during the preceding day or so. On examination he appeared ill. He was restless and dyspneic, with audible grunting expirations. Over the left side of the chest breath sounds were suppressed. His throat was mildly red and his nose somewhat congested. The circumcision wound appeared normal. The rectal temperature was 102.4 F.

The following morning his general appearance and behavior were unchanged. His rectal temperature was 101 F. On inspection of the chest, however, the left side appeared full and practically immobilized. The percussion note on this side was tympanitic, and breath sounds were not heard. By percussion and auscultation the heart was located well to the right of the sternum. The baby was hospitalized and the diagnosis of pneumothorax on the left side was confirmed on admission by roentgenogram (fig. 1).

A consulting phthisiologist advised against decompression of the lung in view of the absence of cyanosis and of the relatively satisfactory breathing. With a temperature of about 101 F., the baby showed little change for approximately thirty-six hours, when periods of cyanosis occurred and the temperature rose

abruptly to 103 F. Respiration became more labored and the cyanosis more constant. Suppressed breath sounds with fine râles were noted in the left side of the chest. A second roentgenogram (fig. 2*A*), on May 25, indicated fluid and multiple pockets of air in the left pleural cavity. Displacement of the mediastinum and diaphragm was more prominent than in the first roentgenogram. Thoracentesis yielded air and some clear yellow fluid. This exudate was sterile on direct smear and culture. On the following day aspiration had negative results. Roentgen examination (fig. 2*B*) revealed a more normally located heart and diaphragm, suggesting equalized pressure between the two pleural cavities. On May 27 definitely accentuated breath sounds and numerous coarse râles on the left side indicated extensive consolidation of the lung. Râles were also present in the root region of the right lung posteriorly. On May 29 thoracentesis yielded approxi-

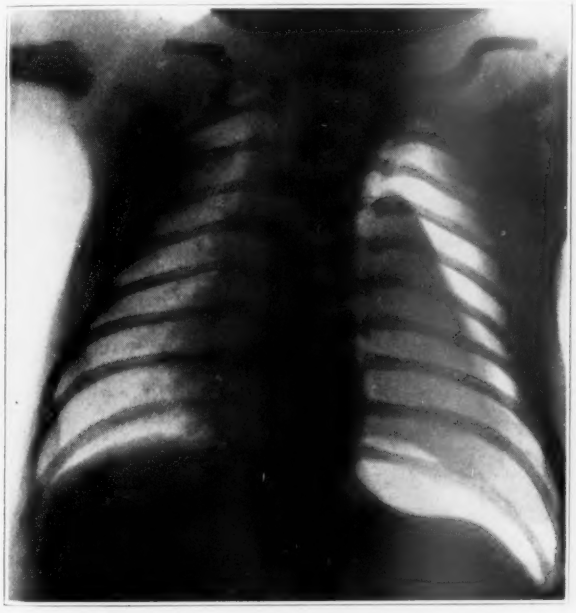

Fig. 1.—Roentgenogram taken on the infant's admission to the hospital, on May 23, 1929, showing pneumothorax on the left side, with displacement of the heart, the mediastinum and the left side of the diaphragm.

mately 50 cc. of purulent fluid, which was shown by direct smear and culture to contain staphylococci. A catheter was fixed in the left side of the chest, and a variable amount of drainage followed at irregular intervals.

Therapeutically, oxygen by nasal catheter, blood transfusion, parenterally administered fluids and a specific bacteriophage were used, but the course of the disease was progressively downhill, with terminal distention and signs of intoxication. Convulsions occurred, although the spinal fluid was normal, and death followed shortly afterward, on June 4, after an illness of thirteen days.

Gross Postmortem Examination (Dr. H. M. Jamieson; June 4, 1929).—The body was that of a well developed white boy about 1 month old with a healed circumcision wound. The left side of the chest was prominent, and a recent

surgical puncture from which pus exuded was present in the fifth intercostal space. The left pleural cavity contained some air and about 200 cc. of thick purulent material mixed with fibrin. The left lung was collapsed and formed a knob against the hilus, and the pleura was covered with fibrin. On the lateral aspect of the lower lobe was a defect 7 mm. long which connected the pleural cavity with a small bronchus. The pulmonary parenchyma was firm. Cut surfaces revealed numerous wedge-shaped, firm, dark purple-red subpleural areas. Many of them were softened at the center and contained abscesses, i. e., septic intarcts with abscess formation. The right pleural cavity contained about 50 cc. of cloudy fluid. The pleura of the right lung was granular, and the lung itself, although it was crepitant and contained air, had numerous septic infarcts similar to those in the left lung.

The other findings consisted of recent fibrinous pericarditis, both the visceral and the parietal pericardium being lined with a thin layer of shaggy fibrin, and a very small recent vegetation on the free margin of the posterior leaflet of the

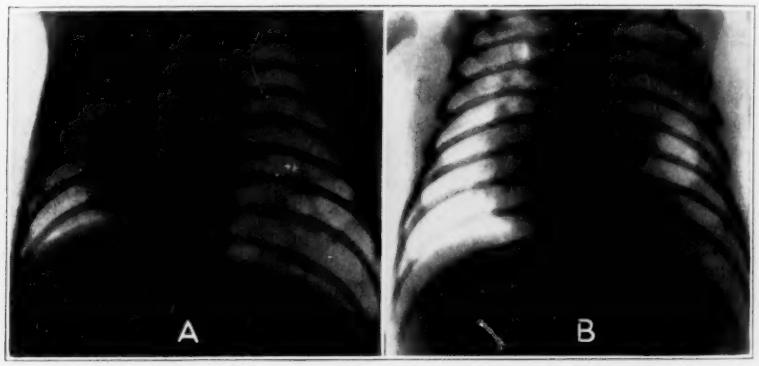

Fig. 2.—Roentgenograms of the lungs. *A*, taken on May 25, 1929, indicates increased tension of the left pleural cavity, concurrent with the onset of severe respiratory embarrassment; the air and the pleural exudate suggested by the film were subsequently aspirated. *B*, taken on May 26, shows a marked decrease in tension of the left lung following the thoracentesis of the preceding day.

aortic valve—endocarditis minima. The other organs showed only parenchymatous degeneration resulting from sepsis. The brain was swollen, very soft, hyperemic and edematous.

Microscopic Postmortem Examination (Reviewed by Dr. Perry Melnick).—Sections of the lungs (fig. 3) revealed the picture characteristic of septic infarcts. In the wedge-shaped areas previously described the alveoli were widely distended by an exudate consisting chiefly of red blood cells mixed with many pus cells and alveolar phagocytes, all enmeshed in a network of fibrin. Scattered everywhere in these regions were huge numbers of cocci arranged in clumps (staphylococci). In many areas the lung tissue was necrotic and heavily infiltrated by pus cells. Some of the smaller branches of the pulmonary artery contained organized thrombi. At the border of the infarcts was a zone of polymorphonuclear leukocytes. The adjacent lung tissue was hyperemic and edematous. The pleura was

covered by a thin layer of fibrin and pus cells. The small vegetation on the posterior leaflet of the aortic valve was a very recent one. The epicardium was covered by a small amount of fibrin and leukocytes.

Summary of Anatomic Findings.—The anatomic diagnosis was: (1) pneumothorax and empyema of the left pleural cavity; (2) fistulous communication between a small bronchus and the left pleural cavity; (3) multiple septic infarcts with abscess formation in both lungs; (4) recent fibrinous pericarditis; (5) endocarditis minima of the aortic valve; (6) parenchymatous degeneration of the liver, kidneys and myocardium; (7) inflammatory hyperplasia of the spleen;

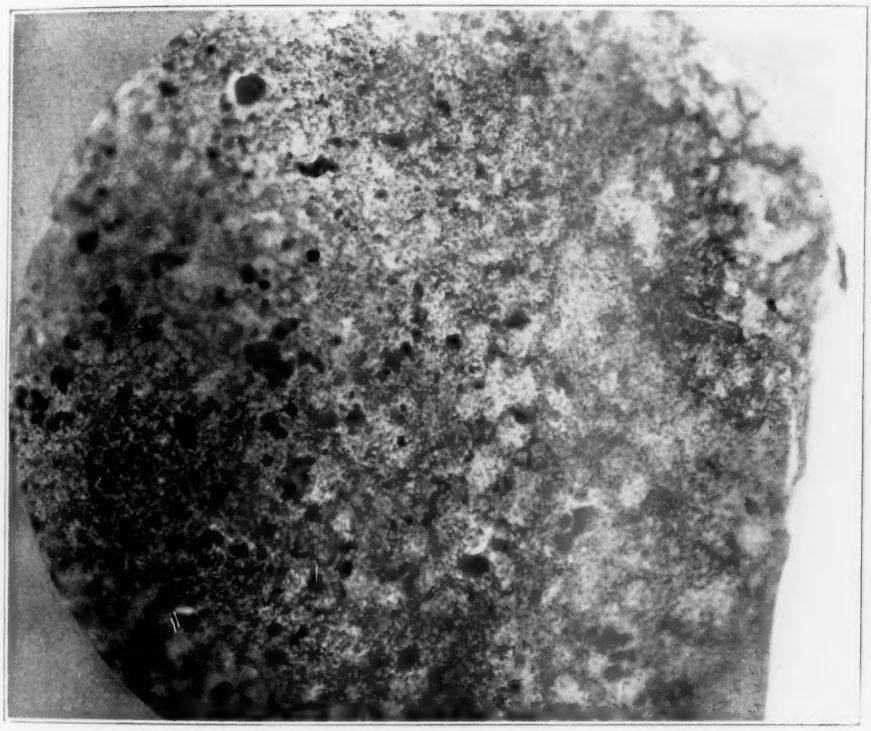

Fig. 3.—Low power view of septic infarct of the lung, showing alveoli filled with hemorrhagic exudate and many clumps composed of huge numbers of staphylococci (hematoxylin and eosin; ×20).

(8) severe edema and hyperemia of the brain, and (9) recently healed circumcision wound.

Multiple septic emboli of staphylococci apparently reached the lungs from some distant focus of infection, either an infected circumcision wound or an infection of the umbilical cord. These produced multiple septic infarcts with abscess formation. One of the abscesses beneath the pleura in the lower lobe of the left lung ruptured into the left pleural cavity and produced a fistulous communication with a small bronchus. Pneumothorax ensued, followed by infection and empyema. The infant died of sepsis after fibrinous pericarditis and endocarditis minima developed.

COMMENT

Other than infection, the generally accepted causes of pneumothorax of the new-born are congenital defects, such as cysts and fistulas, and mechanical factors, e. g., traumatic resuscitation, cough and enlargement of the thymus. The pathologic observations available in approximately one third of all reported cases do not settle satisfactorily the natural question as to what rôle minor congenital weaknesses and defects play in regard to the so-called traumatic type. In the infectious type the chief point of interest is the source of infection. It has been suggested that pneumonia and pulmonary abscesses antedating pneumothorax are secondary to descending disease of the respiratory tract or to passage of the tracheal catheter during resuscitation. In the case under discussion the septic infarcts of the lungs showed that the abscesses immediately responsible for the pneumothorax were probably metastatic foci secondary to some unrecognized distant site of infection. Two such sources must be considered—omphalitis and infection of a circumcision wound. Clinically these regions were normal but pathologic examinations were not made.

The liability of obscure primary infection with later complications is established by the very interesting findings of Dunham[5] in a study of thirty-nine cases of verified septicemia in new-born infants. In eight cases signs of infection appeared only after the second week, and six patients showed no apparent source of infection. Of seven cases of demonstrated omphalitis, in only three had the condition been recognized clinically. Of eleven cases of staphylococcic infection, cutaneous lesions were noted in only five. Of six cases of pneumonia, in three the condition occurred with a staphylococcic infection. Staphylococci were responsible also in one of the two cases of infection of a circumcision wound.

In view of these findings, it is apparent that the cases of infectious pneumothorax hitherto described have much to suggest a common pathogenesis. Two of the three normally delivered boys had been circumcised; all three were hospitalized during the third week of life with fully developed tension pneumothorax secondary to pulmonary abscess. In the two cases in which cultures were made, staphylococci were found. In the case under discussion, in which cultures were positive, there were abscesses of the lung based on multiple septic infarcts. The early fatal outcome in all cases was essentially a result of toxemia, with the interesting pneumothorax incidental to sepsis of a malignant type. While coincidence might explain the clinical and pathologic similarities in such a

5. Dunham, E. C.: Septicemia in the New-Born, Am. J. Dis. Child. **45**: 229 (Feb.) 1933.

small group of patients, it would nevertheless appear necessary in the presence of infections of this kind to rule out conclusively the possibility of metastatic infection from a denuded skin surface.

SUMMARY

A third case of infectious pneumothorax in a new-born infant is reported, which adds to the now existing small group of recorded cases due to all causes. Pathologic study in this case revealed multiple metastatic pulmonary abscesses of staphylococcic origin as the basis of the pneumothorax. Notable similarities between the three recorded cases of infectious pneumothorax in the new-born suggest a pathologic syndrome for this type. Although this particular type of pneumothorax is apparently within the limits of clinical diagnosis, all treatment to date has proved ineffectual.

Progress in Pediatrics

CALCINOSIS UNIVERSALIS AND CALCINOSIS CIRCUMSCRIPTA IN INFANCY AND IN CHILDHOOD

THREE CASES OF CALCINOSIS UNIVERSALIS, WITH A REVIEW OF THE LITERATURE

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AND
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Calcinosis is the term applied to the abnormal deposition of calcium salts in the skin, subcutaneous tissues, muscles and tendons of the body. The first authentic case was reported in association with scleroderma by Weber in 1878, who interpreted the condition as a form of gout. Since then, the syndrome has been the subject of a great deal of discussion and controversy as to the etiology, the pathology and the therapy concerned.

REVIEW OF THE LITERATURE

Calcinosis has been recognized as not being limited to any one disease and has been reported in association with a variety of conditions: scleroderma (Langmead; Tisdall and Erb; Pollitzer; Bayless; Delherm, Morel-Kahn and Coupout; Durham; Bruusgaard), scleroderma with sclerodactylia (Merklen and Vallette; Bertolotti; Olson; Thibierge, Spillman and Weissenbach; von Bernuth, case 2), scleroderma with Raynaud's disease (Hunter; Paisseau, Schaeffer and Scherrer), sclerodactylia alone (Scholefield and Weber), sclerodactylia with Raynaud's disease (Davis), Raynaud's disease alone (Logan; Christman; Walker; Wilson), diabetes (Davis and Warren), chronic nephritis (Weidman and Schaffer; Maloney and Bloom), dermatomyositis (Rudolph; Dietschy; Rothstein and Welt, cases 1 and 2 in this report), lipodystrophia progressiva (Kuznitzky and Melchior), leukemia (Riehl), osteomyelitis of the pelvic bones, with staphylococcic septicemia (Jadassohn), myositis ossificans (Gaté, Michel and Thévenon; Turpin, Brun and Guillaumin) and renal rickets, or dwarfism, with arterial degeneration (Lightwood).

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Classification.—In 1907 Reines reported observations on a case of calcinosis under the title "Pétrificatio cutis circumscripta." In 1912 Versé described a case of calcinosis in which he called the condition calcinosis universalis, since the calcification involved not only the skin but the deeper structures. Since then, calcinosis has been subdivided into two general groups, according to the classification suggested by Reines and Versé—calcinosis circumscripta and calcinosis universalis.

In calcinosis circumscripta the calcific deposits are primarily limited to the extremities, and their disposition is frequently symmetrical. The deposits of calcium are often found around the joints. The condition is most prevalent in persons in the second half of life. In calcinosis universalis there is a tendency for widespread multiple calcareous deposits not only in the skin but in the deeper structures (subcutaneous tissues, muscles and tendons), especially in the region around the joints. Calcinosis universalis is observed in patients in the younger age groups, most frequently in the first two decades of life (table 1). Although it will be noted that contractures occur in both groups, limiting the motion of the joints, the joints as a rule are not involved by calcific deposits save for occasional exceptions (Wilens and Derby; Bruusgaard). As will be pointed out later, in some of the cases reported in the literature the condition was on the borderline between the two main types and it is difficult to ascribe it definitely to the one or the other group.

It is of interest at this point to mention another condition of abnormal calcific deposition which is now recognized as a separate entity, the so-called metastatic calcification of Virchow. This condition has been studied and described by Wells, Schulze and others and is known to differ from the aforementioned types of calcinosis with which this report is concerned. In metastatic calcification an oversaturation of the blood with calcium salts is considered to occur, so that deposition of the lime salts may take place without previous or concomitant degeneration of tissue. Wells pointed out that the deposits occur where carbon dioxide is least abundant. He collected reports of 31 cases from the literature and added 1 of his own. Several of the cases of metastatic calcification which occurred in children will be briefly referred to later.

Age.—In 1931 Steinitz published a comprehensive review of the literature on calcinosis. He grouped 105 cases, including 1 of his own, according to the two main subdivisions. In his series, 71 cases were classified under the heading of calcinosis circumscripta and 34 cases under the heading of calcinosis universalis, or a ratio of 2.1 : 1. The youngest patient with calcinosis circumscripta in this series was 4 years old (de Fine Licht); the oldest was 82 (Steinitz). The youngest

patient with calcinosis universalis was 5 weeks old (Tisdall and Erb); the oldest was 36 (Bertolotti). Table 1 indicates the distribution of the cases in Steinitz' series according to age in decades.

Sex.—Calcinosis occurs more frequently in females than in males, but the ratios vary with the two general groups. In Steinitz' series, the sex was stated in the reports of 67 cases of calcinosis circumscripta. Fifty-seven of the cases (85 per cent) occurred in females, and 10 (15 per cent) in males, or a ratio of 5.7 : 1. The sex was stated in reports of 33 cases of calcinosis universalis. Seventeen cases (51.5 per cent) occurred in females, and 16 (48.5 per cent) in males, or a ratio of 1.06 : 1. Thus, calcinosis circumscripta occurs most frequently in females, the ratio for the two sexes being almost 6 : 1, whereas, for calcinosis universalis the distribution between the sexes is almost equal.

Interestingly, of a series of 7 cases of calcinosis circumscripta in children, reported in this paper, 5 occurred in females and 2 in males, or

TABLE 1.—*Distribution of Patients According to Age in Steinitz' Series*

	Calcinosis circumscripta		Calcinosis universalis	
Decade	Number of Patients	Percentage	Number of Patients	Percentage
1	2	3.1	10	30.3
2	10	15.6	12	36.4
3	11	17.2	6	18.2
4	11	17.2	5	15.1
5	8	12.5	..	....
6	14	21.9	..	....
7	7	10.9	..	....
8	..	....	..	....
9	1	1.6	..	....
Total	64		33	

a ratio of 2.5 : 1. Of the 32 cases of calcinosis universalis of this series in children, 20 occurred in females and 12 in males, or a ratio of 1.7 : 1. The total number of cases of calcinosis in children occurring in females was 25, whereas 14 occurred in males, or a ratio of 1.8 : 1, in contrast to the ratio according to sex for all age groups in Steinitz' series of 5.7 : 1.

Etiology.—The etiologic factors causing the formation of the calcific deposits are not known. Many theories have been advanced, but none have been universally accepted. Endocrine disturbances, particularly of the parathyroid gland, were thought to play a rôle in the production of calcification, but in practically all the cases, with only a rare exception (Hein), the concentration of calcium in the blood has been within normal limits. Furthermore, no changes in the parathyroids have been observed at necropsy.

Some observers have presupposed that a noxa, either traumatic or infectious, causes a local destruction of tissue, which is followed by the deposition of calcium salts at that site. Aisenberg reported a case

in which calcinosis occurred soon after an attack of malaria, and he expressed the opinion that the calcification was due to changes in the calcium metabolism as a result of injury to the parathyroid glands by the malaria. Hamlin recently reported a case of calcinosis circumscripta occurring in a 23 year old man, following a local infection of the hand. Small calcified nodules were present throughout the soft parts of the hand, with particular localization around the phalangeal and metacarpal joints. Jadassohn, in his report of a case of metastatic calcification following osteomyelitis with staphylococcic septicemia (referred to later), expressed the opinion that a toxin had in all probability diminished the vitality of the cells and that this in some way favored the deposition of calcium salts. However, he did not observe any evidences of degeneration of either the elastic or the connective tissue fibers at the site of the most recent calcareous deposits.

A disturbance in the vascular supply to a part has been advanced as a predisposing factor to the deposition of the calcium salts. Barr, for instance, considered that the process is the expression of a locally damaged tissue, especially following the nutritional defects of Raynaud's disease or scleroderma. He regarded the process as one of dystrophic calcification and thought that in most cases abnormal calcification depends on a diminished blood supply and is preceded by changes resembling hyalinization. Weissenbach, Basch and Basch stated that the important etiologic factor is injury to the tissue, although they expressed the opinion that endocrine dysfunction may play a part. They reported circulatory injury with capillary disorder in all cases, leading to degeneration of the connective tissue, with secondary sclerosis.

Morse suggested the possibility of the presence of a lipolytic ferment in the subcutaneous tissue, for he found areas of fatty degeneration with lime salts replacing the fat cells on histologic examination of a specimen obtained at biopsy. After histologic examination in a case of calcinosis, with chronic nephritis as an associated factor, Weidman and Schaffer stated that, in their opinion, the calcification is a disturbance of the fat metabolism in the epidermal cells, with the deposition of lime salts occurring secondary to the fatty degeneration.

However, other observers, who have been unable to confirm Morse's observations, contended that degenerative changes need not precede the calcification. On histologic examination of a biopsy specimen from Wilens and Derby's patient, Bauer, Marble and Bennett did not find evidence of an antecedent necrosis of tissue or of degenerative or inflammatory changes. Their studies revealed the deposition of finely divided particles of calcium around the periphery of fat cells, finally replacing the fat cells and fat lobules. Pospelow mentioned the affinity between elastic fibers and calcium salts and expressed the opinion that deposits can occur in normal elastic tissue. Swanson, Forster and Iob concluded

from the uneventful history of their infant that calcification can occur in apparently normal tissue, although a specimen was not taken for biopsy. Thus, there is a marked difference of opinion as to whether calcium salts may be deposited in normal tissue or whether the calcareous areas must necessarily be the site of previously damaged or degenerated tissues.

Disturbances in the calcium and phosphorus metabolism have likewise been suggested as etiologic factors. Bauer, Marble and Bennett conducted metabolic studies in the case originally reported by Wilens and Derby, and their observations indicated a marked tendency toward retention of calcium and of phosphorus in spite of normal values for calcium and phosphorus in the blood. There was a more marked tendency for retention of calcium than for retention of phosphorus. These authors concluded that the basis of the disorder lies in an abnormality of the calcium and phosphorus metabolism and suggested that the increased retention of calcium and phosphorus may be the result of local cellular conditions as yet undetermined. On the other hand, Tisdall and Erb and Wilens and Derby reasoned that the usual normal values for calcium and phosphorus in the blood militate against the theory of a disorder of the calcium and the phosphorus metabolism.

Vannini, Umber and Staub each carried out similar metabolic experiments for shorter or longer periods on patients with calcinosis circumscripta. Their observations have been considered as inconclusive by other observers because the values obtained for the retention of calcium and of phosphorus did not show a significant or consistent variation from normal.

Craig and Lyall also considered a calcium and phosphorus imbalance to be the predisposing factor in the deposition of the calcium salts. These observers fed their patient di-sodium hydrogen phosphate for a period of six weeks, following which the calcareous deposits were palpably decreased and had almost disappeared on roentgen examination. Their method was based on the demonstration by Greenwald and Gross that in animals excretion of calcium occurs after the intravenous administration of phosphates and on the observations by Jeppsson of an increase in the excretion of calcium in the feces of children after the oral administration of di-sodium hydrogen phosphate or of the equivalent salt of potassium.

Moggi considered the calcification in his case to be due to excessive cholesteremia resulting from prolonged exposure to the sun, the patient being inherently hypercholesteremic. However, he did state that this etiology could not be ascribed to the condition in all cases. Nevertheless, in none of the cases in children in which the concentration of cholesterol in the blood was stated were abnormal values of cholesterol obtained. Furthermore, heliotherapy and therapy by irradiation with

a quartz mercury vapor lamp were employed continuously throughout a four year period by Hein, with subsequent disappearance, rather than an increase, of the calcific masses.

We agree with Langmead that scleroderma, dermatomyositis, calcinosis and myositis fibrosa are all related and that scleroderma and dermatomyositis are almost inseparable. It is our opinion, based on observations in the cases reported here, that the calcinosis occurs as a subsequent stage in the progressive development of some basic process, which first may have manifested itself as dermatomyositis (cases 1 and 2) or as scleroderma (case 3).

A brief consideration of the results of Durham's studies of the capillaries in a case of scleroderma is of interest. Enlargement of the capillaries, with distended, bulblike venous ends, and a sluggish flow of blood were observed. After an injection of epinephrine an almost complete stasis occurred in the smaller capillaries and a marked slowing in the larger capillaries. These observations are of possible etiologic significance in view of Hofmeister's opinion that as soon as a fluid loses its free carbon dioxide a deposition of calcium phosphate can occur, provided that there is neither an increase in the velocity of the blood flow nor an increase in the protein content.

Symptom Complex and Diagnostic Criteria.—In some cases the discovery of the calcified deposits has been preceded by an acute febrile illness followed by muscular weakness (Craig and Lyall; Wilens and Derby; Morse; Kennedy; Rudolph). The patient may suddenly stumble and fall or may show difficulty in walking and unsteadiness in gait. After a variable length of time, the calcareous deposits may then be discovered either as palpable masses or as local areas of softening, with spontaneous ulceration followed by a calcareous discharge.

When scleroderma or dermatomyositis is associated with or precedes this condition, the skin may stiffen around any or all the joints. Resultant fibrosis and the formation of scar tissue may cause contractures which produce fixation of the joint and result in a marked limitation in motion. Disturbances in gait and unsteadiness of balance will result, owing to interference with the function of the joint. When the calcareous deposits are numerous in the periarticular soft tissues, the firm encasing effect of the lime salts will cause a stiffening of the joint, thereby interfering with its mobility (Bauer, Marble and Bennett).

As the calcium salts are laid down in increasing concentration, the deposits gradually thicken sufficiently to become noticeable. The calcification may occur in the skin itself, resulting in firm, irregularly-shaped plaques. Nodules or masses of various sizes may be felt in any part of the body, at times being so superficial that they appear to be just underneath the skin, or they may be palpated more deeply in the subcutaneous tissue itself or may be found lying along the course

of tendons and nerves or along the free borders of the muscles. The sites of most frequent predilection are in the axilla (along the free border of the pectoralis major muscle), around the knees, elbows, hips and buttocks, along the length of the femur and along the length of the metacarpal and the metatarsal bones. The masses may be fibrous and firm, or they may be stony or marble-like. The nodules may be smooth, discrete and shotlike, or they may be coalesced and grouped to form larger, irregularly shaped masses or plaques.

At first the calcareous nodules or masses may be painless, and the overlying skin may be freely movable and normal in appearance. Later, when the pressure of the calcareous deposit on the superficial layer of the skin is sufficiently great, the mass may become painful and tender. The overlying skin frequently becomes reddened; necrosis and ulceration finally occur, with the extrusion of a chalklike gritty material. The discharge usually consists of calcium carbonate and phosphate in varying proportions, as may be determined on chemical examination. Bauer, Marble and Bennett analyzed the contents of a calcareous nodule obtained in a specimen for biopsy. They found a negligible quantity of uric acid, a moderate amount of cholesterol and fatty acids and calcium and phosphorus in the amount and ratio commonly found in adult bone and in pathologic calcification in human subjects.

Following the spontaneous ulceration of the skin over the broken-down areas and the discharge of the chalky contents, a sinus tract remains which heals with difficulty. When healing does take place, a scar or cicatrix results, which not only may be painful but if near a joint may interfere with the motility of the part. Infection is a constant source of danger.

The symptoms often depend on the location of the calcareous deposits. Provided no infection occurs, the general health of the patient is affected only by the limitation of his activities by the mechanical disturbance resulting from the stiffening of the skin and muscles, the contractures and the pain due to the pressure of the calcareous masses on the skin when the patient is sitting or lying. Should infection take place following ulceration, the danger of a resultant sepsis is real.

Calcinosis should be suspected in any case in which stiffness of the joints and contractures develop. Usually the diagnosis is thought of only after the irregular calcareous masses or nodules either are felt underneath the skin or are noted to be involving the skin at the sites mentioned previously. In other cases it is only after the appearance of the chalky discharge from the spontaneous ulceration or the incision of a local abscess that the true calcareous character of the contents of the necrotic, broken-down area is recognized by the physician. Histologic examination of a nodule removed for biopsy may reveal the pres-

ence of granular particles of lime salts embedded in the interstices of a spongelike matrix of fibrous connective tissue or of subcutaneous fatty tissue (F. P. Weber; Wilens and Derby), or it may show the deposition of calcium salts at the site of degenerated fatty tissue (Morse; Weidman and Schaffer) or of degenerated fibrous connective tissue (Carles; Rudolph; Hein). Occasionally, foreign body giant cells are observed on microscopic examination (Wilens and Derby; Brooks; Rothstein and Welt, case 1).

Definite confirmation of the diagnosis of calcinosis may be obtained by a roentgen examination of the affected part. The calcific deposits appear as dense shadows on the film, varying in size and shape. They may be situated in the zone of subcutaneous tissue or may be grouped around the affected joints. At times the deposits appear as dense shadows or streaks lying along the course of muscles, tendons or nerves.

One fact of utmost importance must be stressed at this point. Nodules may not be felt on physical examination and the skin may appear to be grossly uninvolved, yet calcinosis may be found to be present on roentgen examination. In Tisdall and Erb's first case there was no involvement of the soft parts, and the calcareous deposits were limited to the epiphyses of the long bones and to the patellae. It is obvious that in such cases the diagnosis can be made only by the presence of shadows on the roentgenograms caused by the lime deposits.

The importance of roentgen examination of the extremities and the pelvis cannot be stressed too strongly whenever a patient gives a history of an acute febrile illness of indefinite origin followed by muscular weakness, lassitude, disturbances in the gait or in the function of the joints due to contractures and stiffening of the joints or of the skin from a preceding scleroderma or dermatomyositis. Certainly when nodules or irregular masses are palpated in the skin and subcutaneous tissue, whether or not necrosis, spontaneous ulceration and extrusion of a chalky material have taken place, roentgen evidence is needed to substantiate the presence of abnormal calcific deposits.

It is of interest to note that in practically all the cases the chemical values of the various constituents of blood have been reported unchanged. The concentrations of calcium and phosphorus in the blood were within normal limits save in 1 case of hypercalcemia (Hein's case, with a calcium content of 16 mg. per hundred cubic centimeters of serum). Moggi, as noted before, reported hypercholesteremia in 1 case.

Anemia is an inconstant finding. The reaction to the Wassermann test and to the cutaneous tests with tuberculin have usually been negative. Abnormalities have not been noted in the urine, although calciuria may be observed (Schulze).

Course and Treatment.—The course is chronic. Remissions and exacerbations may occur. In Grenaud and Lescoeur's case, nodules were first palpated in the abdomen and then over the entire body when the patient was 5 years of age. After an acute febrile illness of two months' duration, the nodules completely disappeared; yet recurrence of the subcutaneous nodules was observed three years later. A similar disappearance and recurrence were reported by Walker.

The symptoms may have been noted over a period of years (Schulze, nine years; Friedländer, nine and one-half years; Rothstein and Welt, cases 1 and 3, ten years) or over a period of weeks or months (Tisdall and Erb, case 1, nine weeks at the time of death; Forster and Swanson, over six and one-half months).

Apparently a spontaneous cure occurred in Forster and Swanson's case (reported by Swanson, Forster and Iob). Calcified deposits were first observed when the patient was 6 weeks of age, but at 8 months of age roentgenograms showed complete disappearance of the shadows of the calcific deposits. No medication had been given. However, one cannot say that the calcareous deposits will not recur unless there is a follow-up of the patient for many years. A recurrence of the deposits would seem more likely than a permanent cure, since the unknown underlying etiologic factors are in all probability still present, and some activating agent or disturbance in the body's mechanism may again cause the deposition of calcium.

There is no specific treatment for calcinosis. No agreement exists on the part of the various observers as to the therapy employed. Drugs and glandular extracts (parathyroid extract, acetylcholine, insulin, salts of pilocarpine), physical therapy, heliotherapy, radiotherapy and even surgical intervention have all been employed, with little success.

Several methods have recently been employed with apparent success in an attempt to mobilize and cause an excretion of the calcium, thereby depleting the storage of the calcium at these abnormal sites. The question arises whether demineralization of the bones may not take place in some cases before the abnormal deposits have been completely decalcified. Brooks is the only one of the various observers who have attempted to bring about the mobilization of the calcium salts from these abnormal sites to have made any comment on whether or not the calcium content of the bones is affected. He observed no demonstrable change in the appearance of the long bones on roentgen examination two months and one year after the institution of therapy with di-sodium hydrogen phosphate.

Based on the previously mentioned demonstration on animals by Greenwald and Gross and on observations in children by Jeppsson of the effects of phosphates administered intravenously and orally, respec-

tively, Craig and Lyall reported a successful result with the oral administration of di-sodium hydrogen phosphate. After six weeks of therapy, a marked improvement in the symptoms resulted, with an almost complete disappearance of the calcific shadows on the roentgenogram. Brooks likewise reported marked improvement in his patient after di-sodium hydrogen phosphate had been given orally for eight weeks. After more than one year of the same therapy, further marked reduction in the extent and density of the calcareous deposits was seen on the roentgenogram, yet prior to its administration the clinical condition and the roentgenographic appearance had grown progressively worse. On the other hand, Jacobowitz administered this salt for six weeks, giving 6 Gm. daily, without any diminution in size of the deposits on roentgen examination. We also were unsuccessful after a month's trial of di-sodium hydrogen phosphate (3 Gm. daily) in conjunction with a diet high in phosphorus and low in calcium in the third case reported here.

Kennedy (1932) reported success following use of the ketogenic diet in a case of calcinosis and concluded that in his case the high fat content of the diet resulted in the withdrawal of calcareous material from the abnormal deposits and in its excretion through the intestine and the kidneys. An improvement in the symptoms was noted after six weeks of treatment, although the course prior to the establishment of the ketogenic diet had been increasingly unfavorable. The ketogenic diet was continued for almost four years, with complete cessation of symptoms and with marked clearing on the roentgenogram of the previously extensive calcareous deposits from the pelvis, the spine and the axillae. Kennedy based his use of the ketogenic diet on the observations of Frölich and of Nelson. Frölich postulated that since an "acidotic metabolism" hinders the healing of fractures and the deposition of calcium in newly forming bone it should be of help in decalcifying undesirable deposits of lime salts in the body tissues. He therefore used a diet high in fat in the treatment of a patient suffering from progressive myositis ossificans, with the result that some of the calcium gradually disappeared and no new deposits were formed. Nelson found that a ketogenic diet produced a negative calcium balance in a small group of children observed over a relatively short period. However, as will be seen later, the use of the ketogenic diet in other cases has not met with success (Jacobowitz; Rothstein and Welt, case 3).

In 1933 Hein reported an excellent clinical result in a case of calcinosis in which treatment was carried out with heliotherapy and irradiation from a quartz mercury vapor arc lamp. The symptoms had cleared and the calcific shadows were not evident on the roentgenogram on reexamination after four years had elapsed.

Prognosis.—The prognosis is good in cases of calcinosis circumscripta, since the deposits are localized and therefore cannot cause widespread interference with functions of the muscles or the joints. In cases of calcinosis universalis the prognosis is poorer because the nodules or masses may be so extensively distributed as to interfere with motion of the joints and cause the development of marked contractures. Furthermore, since ulcerations through the skin may lead to secondary infection and sepsis, the more numerous the nodules and the more extensive the distribution the more likelihood there is of a secondary infection supervening sooner or later in the course of the illness. The infection is difficult to treat. The ulcerated areas and sinuses heal slowly and poorly and frequently break down again subsequently.

However, the several recent reports of successful treatment in cases of calcinosis cannot help make one more optimistic as to the handling of patients with this condition in the future.

REPORT OF CASES [1]

Case 1.—E. B., a previously healthy 3½ year old boy, began to complain of fever and of pain in his legs during the summer of 1911. He was unable to climb stairs and began to walk on his toes. Three weeks later, a cutaneous eruption occurred, and the condition was mistakenly diagnosed as scarlet fever. Painful swellings were noted, at first limited to the legs and later involving the arms as well. Edema of the face, with erythema, appeared, so that finally he could barely open his eyes or mouth. A fluid diet was necessitated owing to the difficulty experienced in mastication. The child was completely bedridden, for both active and passive motion were sharply limited by pain. The sensorium remained free. This condition lasted for about two weeks, following which a gradual improvement took place, so that at the end of another three months the patient was able to leave his bed.

Nine months after the onset of the aforementioned symptoms, pain recurred. Swelling of the left hand was followed by a purplish discoloration of the skin. Pain and swelling of both feet appeared, and the swelling of the left hand persisted. Eighteen months after the beginning of the illness, the right hand had become swollen, particularly in the region of the first and second metacarpal bones. Roentgen examination (February 1913) revealed calcareous deposits in the metacarpal interspaces of both hands and in the region extending along the first phalanx of the second, third and fifth fingers of the left hand. A diagnosis of polymyositis with multiple deposits of lime was made (fig. 1).

Subsequently, small, firm nodules were felt near the greater trochanter of each side, and a globular mass was present between the fourth and the fifth metatarsal bone of each foot (fig. 2). Nodules were also palpated in the buttocks.

1. The patient in case 1 was presented by one of us (S. W.) before the Section on Pediatrics of the New York Academy of Medicine, February 1913 and April 1921. The patient in case 2 was presented by one of us (S. W.) at the Clinical Conference of the Mount Sinai Hospital, October 1916 and before the Section on Orthopedic Surgery of the New York Academy of Medicine, March 1917. The patient in case 3 was presented by one of us (S. W.) before the Section on Orthopedic Surgery of the New York Academy of Medicine, December 1920.

A biopsy was made, and histologic examination of a nodule removed from the buttock revealed deposits of calcium in the subcutaneous tissue surrounded by giant cells; no evidence of fatty necrosis or degeneration was found.

Wassermann reactions of the blood and spinal fluid were negative. Examination of blood smears for an increase in the number of eosinophils and of the stool for Trichina gave negative results. Basal metabolic studies were done, and retention of calcium and magnesium was found.

Two years after the onset of symptoms, a small painful swelling appeared on the middle finger of the left hand, necessitating incision and drainage. A thick, chalky fluid was obtained, which on chemical examination was found to contain 4.99 per cent of calcium oxide and 0.113 per cent of magnesium oxide. Shortly afterward, a small area of necrosis appeared at the base of the first phalanx of the left index finger, which spontaneously ulcerated to extrude a white, gritty material. The sinus opening closed within a few days.

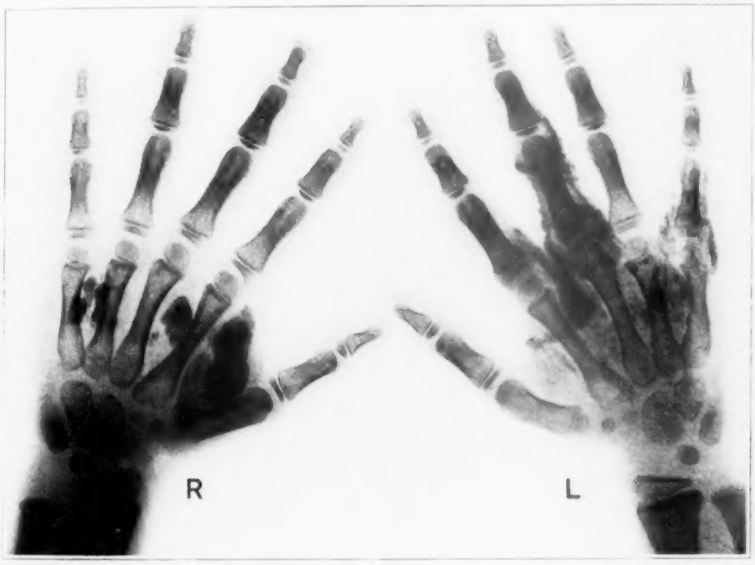

Fig. 1 (case 1).—Roentgenogram (1913) showing calcareous deposits in the metacarpal interspaces of both hands and extending along the first phalanx of the fingers of the left hand.

During the next seven years (from 1913 to 1920), painful localized abscesses at various sites appeared from time to time, caused by a breaking down of the tissue over these palpable nodules. After spontaneous perforation of the overlying skin had taken place, a gritty, chalklike material was extruded, resulting in a diminution or disappearance of the local deposit. The sinuses slowly healed, leaving a depressed scar in some instances. Occasional attacks of muscular pain accompanied by an eruption of somewhat urticarial character occurred from time to time during the first few years. The patient's general condition improved, so that he no longer was confined to bed and enjoyed rather good health. His status in 1920 (nine years after the onset of symptoms), at the age of 12 years, was that of a well developed boy who could walk, run and climb.

Toward the close of 1920, the boy again complained of pain in his left wrist, and a tender swelling developed at this site. Roentgen examination of the left forearm and hand (January 1921) revealed a calcareous deposit in the subcutaneous tissue near the lower end of the left radius. The shadows of the considerable lime deposits in the first, second and third metacarpal interspaces of the left hand, seen on the roentgenograms made eight years previously, had almost entirely disappeared. There was also complete disappearance of similar deposits which had been noted along the first phalanx of the index, middle and little fingers of the left hand (fig. 3). Roentgen examination of the right hand, however, disclosed the fact that the extrusion or absorption of the calcareous material had not been

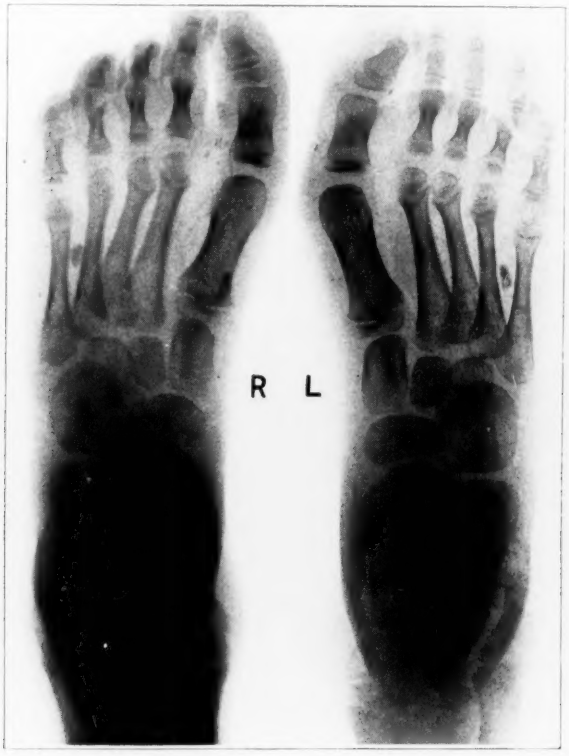

Fig. 2 (case 1).—Roentgenogram showing symmetrical calcareous deposits in the fourth metatarsal interspace of each foot.

as complete in the right hand as that which had taken place in the left hand. The deposits in the fourth metacarpal interspace had entirely disappeared, and only a small part remained in the first metacarpal interspace of the large concretion noted on the original roentgenogram; a small mass was present in the second metacarpal interspace.

The child's condition was very good when he was last seen in April 1921. No further follow-up has been possible since that time.

Comment.—The onset of the illness at the age of 3½ years was characterized by the symptoms and signs of dermatomyositis (polymyo-

sitis). It was only during the three quarters of a year beginning nine months later that the symptom complex of calcinosis supervened. The diagnosis of calcinosis was made at the age of 5 years and was based on the roentgen findings and on the histologic examination of a specimen from a nodule removed for biopsy. The repeated occurrence of necrosis of the overlying subcutaneous tissue and skin leading to spontaneous perforation and extrusion of the calcareous deposits resulted

Fig. 3 (case 1).—Roentgenogram of the left hand (made eight years after that shown in figure 1, 1921), showing a diminution in the size of the calcareous deposits in the metacarpal interspaces and in the region along the first phalanx. Note the appearance of a new deposit in the soft tissue near the lower end of the radius.

in a disappearance of the calcareous masses during the next few years, as revealed on subsequent roentgen examination.

The course was chronic. The duration of the entire illness from the first appearance of symptoms up to the child's last follow-up visit was almost ten years.

The close relationship of the symptoms of dermatomyositis and of calcification in this patient has led us to the conclusion that the two conditions are closely related. In our opinion, the calcinosis represented a further stage in the progressive development of the underlying disease process which first brought about the condition termed dermatomyositis. What factor determines why, and when, the calcification shall occur, and in what sites, cannot be stated. It can only be suggested that a local change in the tissue (possibly in the nature of one or more of the following: a local injury to the tissue following trauma or infection, an interference in the local vascular supply or a disturbance either in the local metabolism or in the local acid-base equilibrium) precedes and determines the site of the calcification.

Histologic examination of a nodule removed from this patient for biopsy did not reveal any evidences of fatty necrosis, of degeneration of the tissue or of inflammation but showed the calcareous deposits surrounded by giant cells. The presence of the latter must be interpreted as a result of a reaction by the body in an attempt to wall off the abnormal deposit of lime salts. This would be the first step toward the elimination of the calcareous deposit which acts as an irritant focus or a foreign body. The actual elimination would then occur in the following sequence: breaking down of the surrounding subcutaneous tissue to form a local abscess, necrosis and spontaneous ulceration of the overlying skin and, finally, the extrusion of the calcareous material.

Case 2.—*First Admission.*—F. M., a 10 year old Italian girl, was admitted to the Mount Sinai Hospital on Dec. 20, 1915, with the complaint of pain in her legs and arms of two weeks' duration. The family history was negative save for the death of the mother, of diabetes, one year before. Except for measles and scarlet fever during early childhood, the patient had been well up to four months prior to admission. At that time, she experienced severe pain in the legs, which lasted for a few days and cleared without medication. Two weeks prior to admission, the pain recurred in both the arms and the legs, accompanied by low grade fever and by swelling of one arm and the forearm of the opposite side. The joints were not red or swollen.

Physical examination revealed: an almost generalized edema, with dry, shiny, tender skin; generalized muscular atrophy; a masklike facies, with puffiness of the face; limitation of motion at the elbows, due to severe pain, but no local heat or tenderness; pain and limitation of motion at the hips but no involvement of the ankle or knee joints, and tenderness over the lower portion of the dorsal region of the spine.

Examination of the blood revealed: hemoglobin content, 70 per cent; red cell count, 4,000,000 per cubic millimeter, and white cell count, 14,000, with 90 per cent polymorphonuclear leukocytes and 10 per cent lymphocytes noted on a differential smear. The Wassermann reaction of the blood was negative. The reaction to the Pirquet test was positive. The blood pressure was 100 systolic and 60 diastolic. Urinalysis did not reveal albumin, casts or red cells; apparently the generalized edema was not of nephritic origin.

Toward the middle of the third week in the hospital, swelling of the upper and lower eyelids occurred, with marked tenderness. Blood counts made on

several occasions revealed a white cell count of 10,000 to 11,000, with from 8 to 10 per cent eosinophils on the differential smear. A specimen was obtained for biopsy to rule out a diagnosis of trichinosis, but histologic examination of a piece of muscle removed from the extensor carpi radiales longior muscle did not reveal Trichinæ.

The temperature varied between 99 and 100 F. throughout the child's stay in the hospital. The pulse rate was rapid at first, varying between 120 and 130 per minute, but then decreased to from 100 to 110 per minute and finally to between 80 and 100 per minute. The respiratory rate remained constant, 24 per minute. Repeated blood cultures were sterile. Roentgenograms of the chest gave negative results (Jan. 21, 1916).

One month after the patient was admitted to the hospital, a firm, hard nodule was felt in the right buttock for the first time. Two weeks later, nodules were palpated in both arms and in the lower extremities (February 1). Roentgenograms of the extremities made at this time did not reveal any abnormal shadows.

At first the differential diagnosis was thought to lie between scleroderma and a glandular deficiency suggestive of myxedema. Later, the diagnosis of dermatomyoneuritis atrophicans was decided on.

Superficial abrasions, with small areas of necrosis, appeared on the face. Erythema of the nose and cheeks spreading down to the neck was noted. This

Fig. 4 (case 2).—Photograph of the patient, showing the characteristic posture. Note the contractures of the knees and the elbows, marked emaciation and muscular atrophy.

gradually disappeared, leaving the skin dry, scaly and tense, with patches of brownish discoloration. The skin of the face assumed a tense, firm, infiltrated appearance, while that on the elbows and thighs presented a thickened marble-like appearance. Loss of function gradually increased in the upper extremities. Stiffness, with contracture of each elbow, resulted, so that the forearms could not be extended beyond a right angle. There was marked loss of power in the lower extremities. Atrophy of the muscles of the entire right lower extremity had occurred. Contracture of each ankle joint, preventing dorsiflexion, and contraction of the vastus muscles were present.

The child was comfortable when let alone but suffered intense pain when moved. The subcutaneous fat and deeper tissues were painful on palpation.

Several months after admission, examination revealed: atrophy, with moderate redness of the skin of the face; marked atrophy of the skin of the neck and the upper portion of the anterior part of the chest; atrophy of the muscles of the arms and legs; contracture of the elbows, knees and ankles, so that the reflex of the triceps muscle and the wrist jerk and knee jerk could not be obtained, and bilateral foot drop (fig. 4).

Ten months after admission, roentgen examination revealed osteoporosis of the pelvis (fig. 5) and of the long bones of the extremities and the presence of many shadows of calcareous deposits distributed throughout the soft tissues, par-

ticularly around the hip joints, along the inner aspect of the thighs (fig. 6) and in the arms. The atrophy of the bones was interpreted as that resulting from disuse.

Determinations of the calcium and the phosphorus content of the blood gave normal values. Study of the calcium and the phosphorus metabolism over a period of three days revealed retention of calcium (5.395 Gm. of calcium oxide) and of phosphorus (0.527 Gm. of phosphorus pentoxide).

The child's condition was unimproved when she was discharged from the hospital on December 27. The diagnosis was dermatomyositis, with subsequent calcinosis universalis supervening. No ulceration had taken place, and a biopsy had not been made.

Fig. 5 (case 2).—Roentgenogram showing osteoporosis of the pelvis. Calcareous deposits in the soft tissues around the hips are faintly visible. There is marked skeletal atrophy.

Second Admission.[2]—The child was transferred from the Mount Sinai Hospital at the age of 11 years to the Montefiore Home on December 27. She was admit-

2. Dr. B. S. Oppenheimer and Dr. J. H. Globus, of the staff of the Montefiore Home, prepared the clinical notes and the observations at necropsy, respectively. The course and observations made during the second period of hospitalization were described recently by Scholz (1934), who reported the case from the roentgenologic standpoint.

Fig. 6 (case 2).—Roentgenogram showing calcareous deposits in soft tissues of the thigh and leg. Note the linear arrangement of calcium salts.

ted with the history of an increasing difficulty in walking and in mastication, loss of weight, progressive weakness and the appearance of small, hard masses in the upper extremities and around the neck.

On admission, physical examination revealed: malnutrition; a masklike facial expression; dry, scaly, tense and inelastic skin, with several areas of brownish discoloration; numerous scars varying in size from that of a grain of wheat to that of a grain of corn scattered over the face and upper part of the neck and, to a less degree, over the hands and arms; old scars of decubitus ulcers over both internal condyles; fixation of the subcutaneous tissue of the thighs, knees and lower part of the legs to the underlying structure; marked muscular atrophy, especially of the extensor muscles of the knees; contracture of most of the joints of both the upper and the lower extremities, with marked limitation of motion; inability to open the jaws beyond 1 inch (2.5 cm.), owing to contracture of the muscles, and small, hard, nontender nodules palpable under the skin in the upper and lower extremities, in the neck and in the buttocks. No abnormalities were observed on physical examination of the heart and lungs.

Roentgen examination on the third day after admission (December 29) revealed extensive calcific deposits throughout the soft tissues of all of the extremities. The shadows were most numerous in the roentgenograms of the thighs, the legs, the upper part of the arms and the forearms, while only an occasional small area was seen in the hands, the feet and the hips. A few small calcified areas were noted in the soft tissues of the trunk and the neck, whereas the soft parts of the head were free from such deposits. The actual bones and the joint spaces were uninvolved by calcific deposits. Diffuse atrophy of bone was present, which was interpreted as being due to inactivity (atrophy of disuse).

Roentgenograms of the lungs revealed a few areas of infiltration in the apex of each lung, particularly in that of the left lung. The heart was moderately enlarged but was otherwise normal.

Subsequently, repeated roentgen examinations did not reveal additional changes except that as time passed the number of calcified areas appeared to have increased slightly and definite evidence developed of tuberculosis of the apex of the left lung, with pleural involvement. However, physical examination of the lungs continued to give essentially negative results despite the roentgen evidence of activity of the pulmonic infection.

During the next few months in the hospital the patient's clinical condition remained relatively unchanged. She walked little and only with great difficulty. Gradually the tenseness of the skin became more and more marked; the muscular contractures increased, so that about one year after the child was admitted to the home she had become completely bedridden, with severe pain in the extremities. The palpable subcutaneous nodules had increased in number, and, although they had been nontender previously, they became painful. Decubitus ulcers developed on the buttocks.

Seventeen months after admission (May 28, 1918), a sudden rise in temperature occurred. The child became dyspneic, and marked tachycardia and evidence of pulmonary involvement appeared. The muscular pain grew intense. Five days after the onset of the acute symptoms, a spasm of the pharyngeal muscles suddenly occurred while the patient attempted to swallow food and was followed by cyanosis and death (June 2).

Observations at Necropsy.—Macroscopic Examination: Two superficial decubitus ulcers measuring 6 cm. in diameter were present in the gluteal region. The eyelids were puffy, and the face was swollen. Evidence of generalized edema was present. Contractures of the upper and lower extremities, with deformities and marked muscular atrophy, were observed. Scars surrounded by areas of induration of the skin were present in the extensor surfaces of the elbows and in the gluteal region.

When the thoracic cavity was opened the thymus was found to extend over the upper two thirds of the pericardial sac high up into the surrounding parietes and structures. The right pleural cavity was completely obliterated by numerous recent fibrinous adhesions extending from all the surfaces of the lung to the surrounding parietes and structures. The left pleural cavity was only partially obliterated by adhesions covering the upper lobe and extending to the lateral, medial and posterior walls of the left side of the thorax. The right lung weighed 450 Gm. Palpation revealed many small areas of consolidation. Cut section revealed the lung to be dark purple, with many dark brown raised areas scattered throughout all three lobes. The left lung weighed 400 Gm. and revealed an appearance similar to that of the right lung, both grossly and on cut section, except that at the apex two cavities, each measuring 4 cm. in diameter, were noted. The cavities were filled with caseous material and were well walled off from the surrounding tissue of the lung.

The hilar lymph nodes were enlarged. Some of the nodes showed evidence of having undergone casecation and calcification.

The pericardial sac contained about 75 cc. of clear yellowish fluid. No pericardial adhesions were noted. The heart was small, weighing 170 Gm.; the left side was contracted, and the right side was markedly dilated. The cardiac muscle appeared to be dull and grayish brown. The subendocardial fat was increased, giving rise to a streaky appearance of the endocardium. The valves and coronary vessels were normal.

The liver weighed 750 Gm.; it was rather small and of normal consistency. On cut section the tissue appeared to be light yellow, and the lobulations were less distinct than normal. The spleen weighed 100 Gm. On cut section the malpighian corpuscles appeared prominently, as small, grayish, rounded areas. The right and the left kidney weighed 130 and 135 Gm., respectively. The capsules were stripped with ease, leaving a smooth surface. On cut section, except for marked injection of the blood vessels, the appearance of the renal tissue seemed normal.

The thyroid gland, adrenal glands, pancreas and ovaries were grossly normal.

Gross examination of the bone marrow did not reveal any evidence of pathologic changes.

The pectoralis, deltoid, biceps and external rectus muscles were dissected out. Grossly, evidences of marked fibrosis and petechial hemorrhages were seen throughout the structure of the muscles at the sites of the calcific deposits. In many places small cystlike cavities were noted, containing degenerated fibrous tissue impregnated with calcium salts.

Microscopic Examination: The heart did not reveal any abnormalities.

The lungs showed patches of bronchopneumonia in some of the sections, with the alveoli filled with polymorphonuclear leukocytes. In other sections, numerous hemorrhagic areas were present, with the alveoli filled with blood, but no thrombosed vessels were found. In some of the sections the alveoli were filled with pink-staining serous exudate. The blood vessels in all the sections were markedly distended with blood.

The liver was the seat of marked fatty infiltration, as evidenced by vacuoles in the hepatic cells seen throughout the sections. The vessels were distended.

The spleen showed no abnormalities, save for a few small circumscribed hemorrhages.

The kidney revealed a large scar, which extended over two thirds of the depth of the cortex and which was made up of numerous small round cells in which many hyalinized glomeruli were seen. The blood vessels were markedly congested, particularly in the medulla.

The thyroid gland was characterized by the presence of solid masses of epithelial cells. Some of the alveoli were lined by a many-layered epithelium, whereas other alveoli were lined by tall cuboidal epithelial cells. Although no definite pathologic changes were noted, the picture was unusual and difficult of interpretation.

In the thymus, the differentiation between the cortex and the medulla was maintained. The Hassall corpuscles were present in the medulla in fair numbers. A lymph node was attached to the thymus. The subcapsular sinus and other lymph sinuses were filled with blood, suggesting the diagnosis of hemolymph glands.

The ovary showed several large graafian follicles.

The skeletal muscle showed definite pathologic changes in the fourteen sections examined: numerous small extravasations; a marked increase in the fibrous connective tissue not only of the septal elements but also of the interfibrillar elements; infiltration of the interstitial connective tissue with small round cells; degenerative changes in the muscle fibers, as evidenced by the swelling and the marked shortening of the individual muscle fibers, by the lack of striations and by the nuclear pyknosis, and round cell infiltration of the muscle fibers.

Sections of the skin showed marked thickening of the blood vessels. In many places the epithelial layers were absent, having been replaced by fibrous connective tissue.

The calcific deposits consisted of calcium phosphate and calcium carbonate in the ratio of 3:1. The lime salts were deposited in the form of fine granules along the connective tissue fibrils and did not involve the muscles. In the tendinous portions of the muscles the calcification was confined to the enclosing fibrous sheaths. In a number of places the calcium deposits were arranged in the form of clusters within cavities. Some of these minute cavities were noted in the deeper layers of the corium and in the subcutaneous fat tissue and were surrounded by a dense fibrous tissue, which was poor in cellular elements. No histologic evidence of fat necrosis could be demonstrated.

Diagnosis.—The anatomic diagnosis was: dermatomyositis, calcinosis universalis, multiple hemorrhages into the lung, bronchopneumonia, tuberculosis of the bronchial lymph node, tuberculous abscess of the apex of the left lung, fibrinous pleurisy and multiple infarcts of the kidney.

Comment.—In this case the symptoms and signs of dermatomyositis appeared four months prior to the patient's admission to the Mount Sinai Hospital. Contractures and limitation of motion of the hips, the ankles and the elbows, with atrophy of the lower extremities, resulted. In view of the edema and puffiness of the face and of the 10 per cent eosinophil count, trichinosis was considered, but Trichina was not noted on histologic examination of the specimen of muscle tissue removed for biopsy.

Whereas nodules were palpated in the extremities four weeks after the patient was admitted to the hospital (February 1916), roentgenograms of the extremities at this time did not reveal any abnormalities. It was only eight months afterward that roentgenograms of the pelvis and hips revealed the presence of the calcareous deposits and thereby led to the diagnosis of calcinosis. Furthermore, although nodules were palpated, necrosis and ulceration of the overlying skin, with extrusion of a gritty, chalky material, did not take place at any time during the course of the disease.

The entire duration of the dermatomyositis was from August 1915 to the time of the child's death, on June 2, 1918, a total of two years and ten months. The diagnosis of calcinosis, based on the positive roentgenographic and histologic evidence, was made in October 1916, or twenty months prior to death, whereas the nodules, which were the first signs of calcinosis, were observed twenty-eight months prior to death.

It is of interest to note that although the reaction to the Pirquet test was positive when the test was made at the Mount Sinai Hospital, roentgenograms of the chest (Jan. 21, 1916) did not reveal evidence of involvement of the lungs or of the hilar nodes by tuberculosis. On the other hand, roentgen examination of the chest, made at the Montefiore Home eleven months later (on Dec. 29, 1916), revealed a few small infiltrative areas at the apex of each lung, especially the apex of the left lung. At necropsy (June 2, 1918) a little over twenty-eight months after the making of the first roentgenogram of the chest, which showed nothing abnormal, tuberculous caseation, with cavitation of the apex of the left lung, and involvement of the bronchial lymph node were noted.

At necropsy, hypertrophy and degeneration of the interstitial fibrous connective tissue were noted, with deposition of calcium salts in the degenerated connective tissue. Although degeneration of the muscle fibers had taken place (as evidenced histologically by swelling and shortening of the muscle fibers, by loss of striations and by pyknosis of the nuclei), no lime salts were deposited in the degenerated muscle fibers. Scholz, in his report of observations on this patient during the second admission, concluded that the lime salts were therefore deposited only in pathologic fibrous tissue (degenerated fibrous tissue). Whether this is actually the case cannot be said. The preceding dermatomyositic process of course must be considered the cause of the degenerative changes. When one considers the reports of other observers, who noted calcific deposits in normal tissue (Wilens and Derby; Pospelow; Bauer, Marble and Bennett), it is possible that the calcification may occur coincidental with, rather than secondary to, the degeneration. Still, the observations in this case are strongly suggestive of the degenerative process being the etiologic factor for calcification.

Again, the close relationship of the dermatomyositis and the calcinosis in this patient, just as in the first patient, favors our belief in the conception of development of progressive stages as explaining the pathogenesis of the two conditions.

CASE 3.—*First Admission.*—R. C., a 6 year old Negro boy, was admitted to the surgical service of the Mount Sinai Hospital on May 26, 1923, with a complaint of a tender swelling of the right thigh of three weeks' duration. The patient had been well, save for a right equinovarus without pain, of one year's duration. His family history was negative. Four older brothers and sisters were living and well.

Three weeks prior to admission, a localized swelling, painful and tender, appeared on the outer aspect of the middle of the right thigh. This lasted for several days and was followed by a swelling of the knee joint on that side. Necrosis and spontaneous ulceration of the overlying skin then occurred, followed by the extrusion of a thick purulent discharge. The swelling of the knee joint subsided shortly afterward.

Physical examination revealed a rachitic, poorly nourished Negro, with the pertinent findings limited to the right lower extremity. The extremity was held in a position of partial flexion and abduction. A perforating ulcer discharging necrotic material and surrounded by an area of induration was present on the middle third of the anterior aspect of the thigh. Equinovarus of the right foot was noted.

The differential diagnosis was thought to lie between tuberculosis, syphilis and an infection of unknown etiology. An exploratory operation was performed on May 29, for a suspected deep-seated abscess of the right thigh. Considerable calcified, gritty material was found undermining the skin for a radius of about 4 cm. Histologic examination of a specimen removed at operation revealed the presence of inflamed granulation tissue and lime salts in large amounts.

The urinalysis gave normal results. Reactions to the Wassermann and the Pirquet test were negative. The patient was discharged on June 11 (sixteen days after admission).

Second Admission.—The child was admitted to the hospital two years later (June 6, 1925) at the age of 8 years, with a history of an increasingly marked deformity of the right lower extremity, increasing inability to walk and progressive weakness. One week prior to admission, the patient experienced an injury to his left elbow, which became painfully swollen. He became feverish. Three days prior to admission, a painful, tender swelling appeared in the left axilla.

Physical examination revealed: marked wasting and emaciation; a marked deformity almost completely incapacitating the child; masses in both axillae and along the posterior axillary folds; similar nodules in the right thigh and along the femoral vessels of both sides; a stony-hard nodule palpable under the skin of the abdomen in the region of the tip of the tenth rib on the right side; ankylosis of the right foot in equinovarus; contracture of the elbows and of the knees; hardness of the entire group of hamstring muscles and a soft, tender, fluctuant mass in the posterior part of the left axilla and in the subscapular region, which seemed continuous with the axillary group of stony, matted-together nodular masses described previously (fig. 7).

The concentration of hemoglobin was 69 per cent; the red blood cell count was 3,800,000 and the leukocyte count was 15,500, with a differential count of 72 per cent polymorphonuclear leukocytes, 26 per cent lymphocytes and 2 per cent

monocytes. Reactions to the Pirquet and the Mantoux (in a dilution of 1 mg.) tests were negative. The Wassermann reaction was negative. Chemical analysis of the blood revealed normal values, including a concentration of calcium of 11.7 mg. The urine was normal. The blood pressure was 90 mm. of mercury systolic and 55 mm. diastolic.

The swelling in the left axilla was aspirated and 10 cc. of thick yellowish pus was obtained. No organisms were present on a smear, but Streptococcus haemolyticus was present on culture.

Masses finally became palpable in the muscles of both thighs and in the calves, varying from the size of a marble to that of a flat plaque (11.5 by 5 cm.) in the right thigh; similar nodules were present in the abdominal wall and in both axillae.

Another examination of the blood revealed: hemoglobin content, 74 per cent; red cell count, 3,900,000 and white cell count, 12,300, with 77 per cent polymorphonuclears and 23 per cent lymphocytes.

Fig. 7. (case 3).—Photograph showing the patient in his usual position. Note the marked contractures and the extreme atrophy. A calcareous deposit in the left axilla is seen as a protuberant mass.

Reactions to electrical stimuli were difficult to determine. Reactivity to the galvanic current was present in the muscles of the arms and legs, although a stronger current was necessary to stimulate the right arm and leg than to stimulate the left arm and leg.

Necrosis and spontaneous ulceration, with the extrusion of a purulent discharge, occurred in the right thigh about two months after admission. Staphylococcus aureus was grown on culture from the purulent discharge.

Three months after admission, small shotty nodules were noted to the right of the umbilicus, and multiple nodules were palpated over the entire left flank, extending to the left side of the abdomen and over the crest of the ilium. Additional nodules were noted in the right inguinal region, in the outer aspect of the right thigh and along the entire length of the right leg. Roentgen examination five months after admission (November 27) revealed: large calcareous deposits in the thoracic wall of the axillary region on the left side at the level of the fifth and sixth ribs; a large area of calcareous deposit approximately 5.5 cm.

in length in the posterior portion of the abdominal wall on the left (fig. 8), and large calcareous masses in both thighs (fig. 9).

During the next few months, areas of fluctuation or of necrosis, with spontaneous ulceration and discharge, appeared in the axillae and in the thighs. At times, cultures of the purulent material obtained on aspiration or from the discharge would be sterile; at other times, cultures were obtained of Str. haemolyticus, Staph. aureus and Streptococcus anhaemolyticus; but no growth was obtained on anaerobic cultures. The breaking down of the calcified areas and the discharge

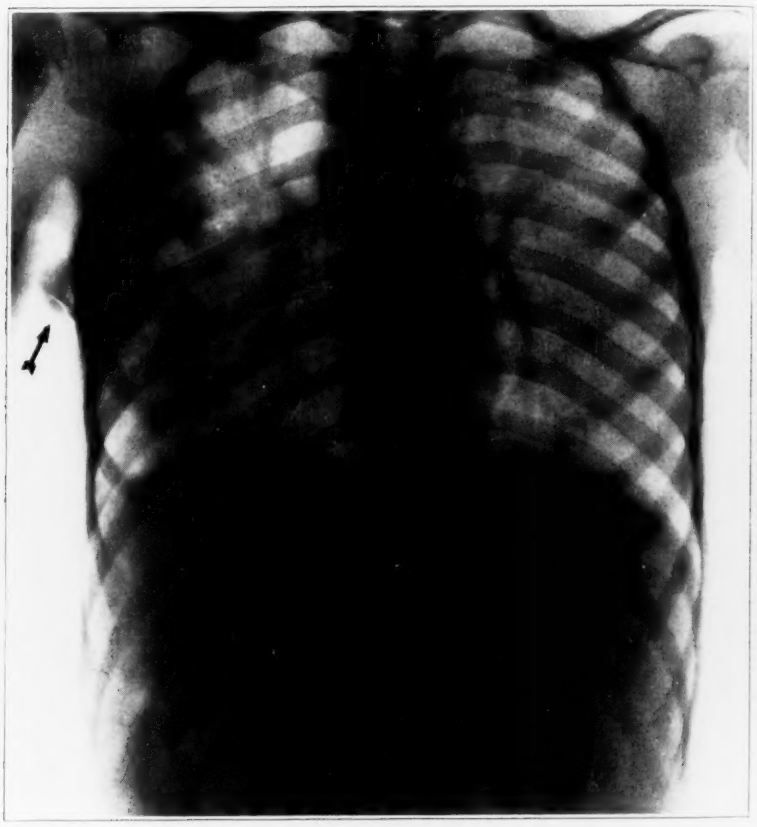

Fig. 8 (case 3).—Roentgenogram of the chest showing the calcareous mass in the left axilla. The calcareous deposit in the abdominal wall on the left side is not visualized.

of pus was accompanied by a febrile reaction of several days' duration. Incision and drainage were resorted to on several occasions, with the evacuation of pus and gritty, chalklike material. Chemical examination (August 9) revealed the presence of calcium phosphate and calcium carbonate in the discharge.

For one month (during the ninth month of the period of hospitalization) the patient was given a diet low in calcium and high in phosphorus (containing 0.38 Gm. of calcium and 0.96 Gm. of phosphorus), with the addition of

di-sodium hydrogen phosphate by mouth (3 Gm. daily). The daily total intake of phosphorus was estimated to be 2 Gm., or 5 times the intake of calcium. The diet high in phosphorus and low in calcium was given in an attempt to mobilize, and cause an excretion of, the excess calcium stored in the abnormal deposits. However, the general condition remained the same, and roentgen examination revealed an increase, instead of a diminution, in the amount of calcified material in the abdominal wall and in the right thigh.

Eleven months after the patient was admitted to the hospital (May 15, 1926), a large, deeply seated abscess on the border of the anterior portion of the abdominal wall on the left side broke through the surface spontaneously and drained. An incision was made to afford better drainage, and the wall of the cavity was found to be lined with a thick layer of lime salts. Five days later a large sequestrum about 2 cm. square was removed from the abdominal wall and on histologic examination was found to consist of bone lamellae.

Determinations of the calcium and phosphorus content of the blood were made periodically. On June 8, 1925, the calcium content of the blood was 11.4

Fig. 9 (case 3).—Roentgenogram showing calcareous deposits in the soft tissues of the left thigh.

mg.; two months later the calcium concentration was 10 mg., and four months later, 9.8 mg., with a concentration of phosphorus of 5.2 mg.; nine months later the calcium content was 10.2 mg., with a phosphorus content of 4 mg. Metabolic studies were conducted during the fourth month in the hospital, and retention of calcium was observed.

Histologic examination of a specimen of tissue removed from the right thigh revealed evidences of a chronic inflammatory process, with deposits of lime salts (fig. 10). The child was discharged unimproved on July 10, 1926, after a thirteen months' stay in the hospital.

Third Admission.—The child was admitted to the hospital for the third time on Feb. 13, 1927, at the age of 10 years, in order to try the effect of the ketogenic diet on the possible absorption of the abnormal calcific deposits. The blood count showed the hemoglobin content to be 50 per cent, the red cell count, 3,500,000,

and the white cell count, 6,600, with 52 per cent polymorphonuclear leukocytes, 44 per cent lymphocytes and 4 per cent monocytes. The calcium concentration of the blood was 8.4 mg., and the phosphorus concentration was 4 mg. The blood pressure was 100 systolic and 64 diastolic.

The child was given a marked ketogenic diet (1:4 ratio) for ten weeks without showing any mental disturbance or drowsiness. The urine constantly showed a 4 plus reaction for acetone. The values for carbon dioxide dropped as low as 27 per cent without evidence of hyperpnea. The basal metabolism

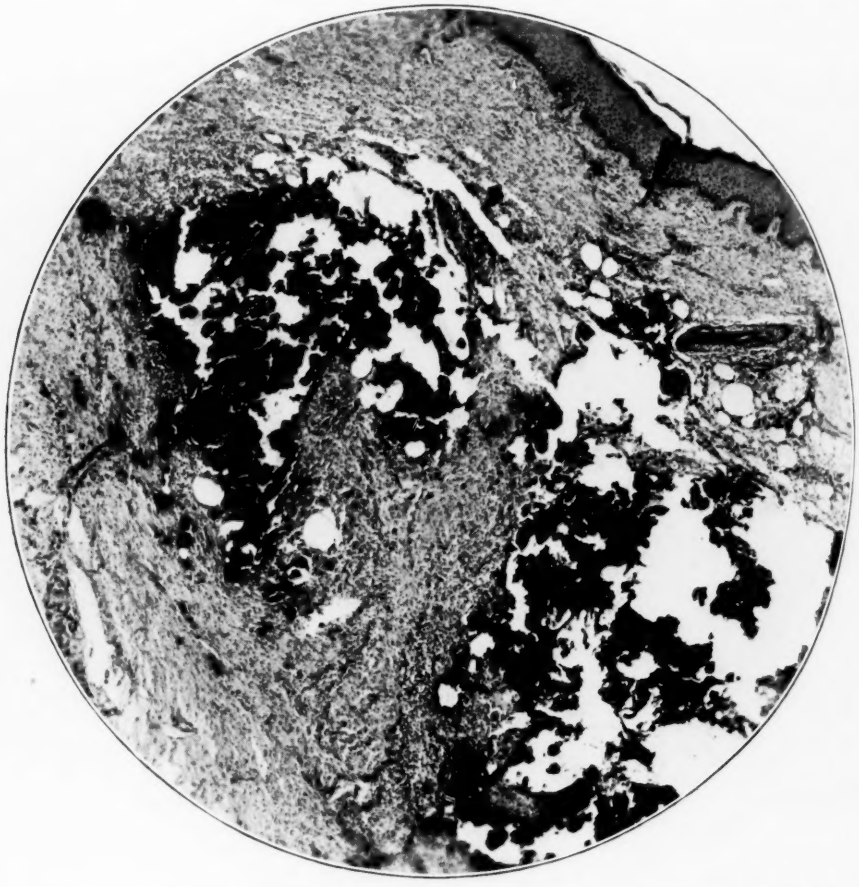

Fig. 10 (case 3).—Photomicrograph showing deposits of calcium salts and chronic inflammatory reaction of the subcutaneous tissue; low power magnification.

(on April 13) was + 21 per cent by the Pirquet standard and + 8 per cent by the DuBois standard. The content of calcium and the content of phosphorus were 10 and 2.6 mg., respectively, seven weeks after admission, and 7.5 and 3 mg., respectively, at the end of the tenth week.

After ten weeks of treatment with the ketogenic diet, roentgen examination did not reveal any diminution in the size or density of the calcific deposits, and no clinical improvement was observed. The ketogenic diet was therefore discontinued. The patient was sent home unimproved on April 23.

Fourth Admission.—The boy was admitted to the hospital for the fourth time on April 2, 1932, at the age of 15 years. During the five year interval which had elapsed between the third and the fourth admission, the child had had numerous abscesses secondary to a breaking down of the skin and of the subcutaneous tissue over the calcific nodules on the legs and arms. Necrosis, spontaneous ulceration and extrusion of pus and gritty, chalklike material had taken place. He had been unable to walk and had been completely bedridden.

Physical examination revealed: extreme emaciation and weakness; contraction deformity of all four extremities; atrophy of the muscles; firm subcutaneous nodules on both lower extremities, and ulceration at several sites on the right leg and thigh, with a whitish, calcareous deposit coating the bases of the ulcers.

The blood pressure was 102 systolic and 26 diastolic. Examination of the blood revealed: hemoglobin content, 71 per cent; red cells, 4,600,000, and white cells, 9,600, with 77 per cent polymorphonuclear leukocytes, 19 per cent lymphocytes, 3 per cent monocytes and 1 per cent eosinophils. The reactions to the Pirquet and Mantoux tests were negative. The Wassermann reaction was negative. Urinalysis revealed no abnormalities. Repeated chemical examination of the blood at five day intervals revealed: concentration of calcium, 9.5, 9.9, 9.6 and 9.8 mg., and concentration of phosphorus, 5, 5.1, 5.1 and 5.2 mg., respectively; carbon dioxide content, between 47.5 and 54 volumes per cent; concentration of urea, between 8 and 12 mg.; cholesterol content, 160 mg., and chloride content, 575 mg.

Chemical analysis of particles lining one of the sinus tracts revealed the presence of calcium carbonate. On culture of the discharge from the ulcer, gram-positive cocci and an atypical strain of Bacillus coli were obtained.

Roentgenograms of the chest, the skull and both arms did not show any evidence of calcific deposits. Roentgenograms of the lower extremities revealed an irregular calcific mass (6 by 4 cm.) in the left popliteal space, a group of calcareous concretions in the anterior region of the right thigh extending along the lower third of the femur and along the upper two thirds of the tibia and a small deposit in the posterior portion of the middle of the right thigh.

Roentgenograms of the abdomen and pelvis revealed a group of calcific shadows above the acetabulum of the right hip and approximately at the level of the greater trochanter of the right femur. The concretions noted six years before on the left side of the abdomen had disappeared. The regions of the dorsal vertebrae, the ribs and the axillae showed no abnormalities. The bones were not abnormal, save for moderate osteoporosis, particularly of the right leg, which was interpreted as being due to atrophy of disuse.

The child was discharged unimproved on April 26. He was seen in the follow-up clinic two months later (June 13), five months later (September 12) and one year later (April 11, 1933). On each visit he has reported the occurrence of new areas of necrosis, spontaneous ulceration and discharge. The contractures have become more and more marked. He has been unable to walk and has been confined to bed.

Comment.—The symptom complex in this case presented the typical appearance and chronic course of calcinosis universalis—the appearance of multiple nodules, or masses, which from time to time have caused necrosis of the overlying skin, with spontaneous ulceration and discharge of chalky, gritty material and, when infected, of pus. A concomitant scleroderma was present at the onset. At the time of the child's first

admission to the hospital (to the surgical service) the abscess of the right thigh was thought to be of several possible etiologic derivations: tuberculosis, syphilis or an obscure suppurative infection. It was only after the abscess was explored surgically that the calcified gritty contents were found. Histologic examination revealed the presence of inflamed granulation tissue and lime salts. However, the true state of affairs was not suspected, nor was the actual diagnosis made until three months after the child's second admission (over two years later). At that time roentgenograms of the thorax, abdomen and extremities revealed the presence of the shadows due to calcific deposits. Such an experience serves to emphasize the necessity for early roentgen examination of the extremities, thorax and pelvis in suspicious cases. This had not been done at the time of the child's first admission to the hospital.

The course in this patient has been chronic, having lasted for over ten years at the time of his last follow-up visit. Emaciation and weakness have been progressive. The contractures, muscular atrophy and deformities have grown more and more marked, with such progressive loss in function as to result in almost complete incapacitation.

Therapeutic measures directed against mobilization and excretion of the calcium stored in the abnormal sites have been unsuccessful. A diet high in phosphorus and low in calcium was given for one month with no success. The ketogenic diet was tried for ten weeks without either clinical improvement or a diminution of the calcific shadows in the roentgenogram. The values for calcium and phosphorus in the blood have always been within normal limits, except during the third admission, when lowered values were noted while the patient was on the ketogenic diet.

It is interesting to note that, while the entire process was progressive in this child, after the operative drainage of a broken-down abscess of the abdominal wall and the extrusion of the calcareous masses during the second admission (May 1926) calcium salts were not redeposited at this site subsequently. This was shown by the absence of calcific shadows in the roentgenogram six years later.

One further point bearing on the pathogenesis of the calcification is of interest. During the second admission, at operation a sequestrum was removed from the abdominal wall and was found on histologic examination to consist of bone lamellae. Just how and why this pathologic formation of bone occurred cannot be stated, but it remains highly speculative.

The prognosis in this case seems grave and must necessarily be guarded. Constant recurrence of areas of breaking down, necrosis, suppuration and ulceration sooner or later in the presence of marked

emaciation and weakness may result in sepsis and death. Our attempts at therapy have been unsuccessful and the surgical measures have merely been palliative and symptomatic—the incision and drainage of such fluctuant abscesses as have not been discharged spontaneously.

ANALYSIS OF CASES OF CALCINOSIS IN INFANTS AND CHILDREN REPORTED IN THE LITERATURE

It would seem to be of pediatric interest to append to this paper abstracts of the cases of calcinosis occurring in infancy and childhood which have been reported in the literature. We have been able to find reports in the literature of 36 cases in infants and children up to the age of 15 years. The pertinent details in these cases, as well as in the 3 cases comprising this report, have been arranged in a table, so that the points of main significance may be more easily observed (table 2). Two other cases have not been included in the series. In 1 of the latter (Goldreich), the patient was a 7 week old boy, who was presented at a pediatric meeting, and in the report of the meeting the title of the condition was stated without a description of the findings or the history. The other case, one of calcinosis circumscripta occurring in a child, with deposits in the legs only, was recently described by Bianchi and Tenconi in an Italian journal, which unfortunately was not accessible to us.

Versé and Duret reported 1 and 2 cases of calcinosis, respectively, in "children," but their cases have not been included in this series because their patients were older than our arbitrarily set age limit of 15 years. Although Versé's patient was 15 years of age when first seen, he was 17½ years of age at the time of his death. Duret's cases occurred in a brother and sister, 16 and 17 years of age, respectively, and represent one of the two instances in the literature of the occurrence of a familial incidence in calcinosis. The other instance is that reported by Lereboullet and Lelong of the occurrence of calcinosis in a mother and child (case 22 in table 2).

Of the 39 cases of calcinosis in infants and children up to the age of 15 years, in 3 the condition occurred within the first two months of life (Zarfl; Tisdall and Erb, case 1; Forster and Swanson), in 8 within the first five years of life, in 19 within the second five years of life and in 12 within the third five years of life. Twenty-five of the cases (64.1 per cent) occurred in females and 14 cases (35.9 per cent) in males, or a ratio of approximately 1.8:1.

Of the 39 cases, 32 may be classified under the heading calcinosis universalis and 7 under the heading calcinosis circumscripta. Some of the cases (Rabère and Leuret; Paisseau, Schaeffer and Scherrer) might be classified with either group. Since Forster and Swanson's case, in which only the lower extremities were involved (thighs and buttocks),

TABLE 2.—*Abstracts of Cases of Calcin*

Case	Author	Age	Sex	Possible Etiologic Factors	Duration Prior to Admission	Symptoms and Signs
1	Curtillet and Dor	8 yr.	F	.....	2½ yr.	Palpable nodules along all four extremities; tion of skin over nodules
2	Timaschoff and Romanoff	8 yr.	M	.....	.....	Numerous palpable nodules, widespread, also trunk
3	Dietschy.....	12 yr.	F	Trauma to knee; scleroderma; dermatomyositis; chronic rheumatic infection	1¾ yr.	Ulcerations and wounds on both knees and pain in both legs; contractures of elbows knees, with fixation and limitation of mo scleroderma of hands and face
4	Rabére and Leuret	6 yr.	M	.....	2½ yr.	Palpable nodules along both forearms, pai pressure
5	Carles.....	6 yr.	M	.....	3 yr.	Painless, progressive stiffening of hip and joints, resulting in fixation and limitation motion; palpable nodules along the pecto muscle, in groin, popliteal spaces and gl regions along the iliac crest
6	Weber.....	6 yr.	F	Multiple infections during preceding 2 years (scarlet fever, diphtheria, pneumonia, axillary and cervical abscesses, otitis media)	1 yr.	Hard subcutaneous nodules palpable in ex and adjoining portions of trunk, around in buttocks; ulceration of skin over som the nodules
7	Zarfl.....	7 wk.	F	Scleroderma	6 wk.	First noted at 10 days of age; weakness; a pigmentation followed by thickening of sk cartilage-like nodules palpable around sh interscapular region, nape of neck, right buttocks and back
8	Schramek.....	9 yr.	F	.....	3 yr.	Palpable masses in soft tissues of hands an ulceration of skin with grayish discharg
9	Langmead.....	4½ yr.	M	Mongolism; scleroderma since birth	Several months	Rash on knees, hands and face shortly afte inability to walk or stand for 2½ years; of knees and ankles for 2 months, with s derma (involvement of skin of cheeks, fi hands, knees, thighs and buttocks); skin shiny and discolored; palpable nodules i border of pectoralis major muscles, left el thighs, legs and popliteal spaces
10	Morse.....	3½ yr.	F	Influenza at 2 years	1½ yr.	Inability to walk for 1½ years; induration lary borders, left elbow, thighs, buttocks, spaces and calf of legs; ulceration of some rated areas; palpable nodules in other areas
11	Czirer.....	8 yr.	M	.....	1½ yr.	Palpable nodules in popliteal space, axillae thighs; formation of an abscess in thigh tating incision and drainage
12	Tisdall and Erb (case 1)	5 wk.	M	.....	5 wk. (since birth)	Marked emaciation and weakness; flexion of almost all joints, with secondary contr of muscles; precordial systolic murmur
13	Tisdall and Erb (case 2)	12 yr.	M	Scleroderma	4 yr.	Pain in ankles; difficulty in walking at one gressive contractures, with deformity of h hips and elbows; finally inability to walk nodules in extremities, trunk, elbows and tocks; erosion of skin of elbows by warty calcareous mass
14	Schulze.....	12 yr.	M	Rickets	8 yr.	Marked rachitic developmental disturbances skeletal structure; crops of hard nodules p under skin of shoulders, elbows, knees, th legs and sacrum; ulceration of skin over s of the nodules with suppuration

...ntgen Examination	Biopsy	Laboratory Observations	Comment
.....	Calcification, with involvement of sweat glands of skin	.....	No improvement
.....	.....	.....	No improvement
...s deposits along tendons of popliteal space and ...ps, triceps muscle, ...ds patellae, trochanters ...f anterior superior ...spine	.....	Calcium carbonate noted on chemical analysis of discharge from ulcerated areas	Death in extreme cachexia; necropsy revealed dermatomyositis; interstitial myositis; atrophy of skin; calcareous deposits along tendons; perivascular infiltration of muscles of heart, bladder and uterus
.....	.....	.....	No improvement
.....	Degeneration and diffuse fibrosis, with calcareous deposits in the necrotic areas	Inoculation of guinea-pig with biopsy tissue did not produce tuberculosis in the animal	No improvement
...ous deposits in lower ...ities, pelvis and upper ...ities, especially around ...s; none in abdomen, ...x or axilla	Spongelike matrix of subcutaneous tissue in interstices of which granular particles of lime salts were embedded	Calcium carbonate and calcium phosphate present in biopsy nodule; culture of biopsy tissue sterile; index of calcium in the blood, by Bell's method = 1.36 (normal = 0.9)	No improvement
	None	.....	Spontaneous disappearance of pigmented areas, cutaneous thickening and nodules by 2 mo. of age
.....	.....	Calcium carbonate and calcium phosphate noted on chemical analysis of discharge	No improvement
...eous deposits in upper ...wer extremities, par...ly along the free border ...pectoralis major ...es	None	.....	No improvement
...eous deposits at sites ...rated areas noted on ...l examination; tissues ...r filled with fine shot	Areas of fatty degeneration, with lime salts replacing the fat cells; calcific deposits walled off by dense connective tissue	Blood calcium and phosphorus normal; Wassermann reaction negative; cutaneous tuberculin reactions negative	No improvement
.....	Chronic inflammatory reaction of connective tissue around calcium deposit	Calcium phosphate noted on chemical analysis of discharge	No improvement
...deposits in the ...yses of long bones of ...extremities (humerus, ...nal end of radius, ulna, ..., distal end of femur); ...line outlined by lime	.....	.....	Death 4 wk. later (at age of 9 wk.); necropsy revealed that the bulk of the section of patellae was cartilaginous, with areas of loose connective tissue scattered throughout the cartilage; degenerative changes were present in connective tissue cells, with calcific deposits in degenerated areas; no inflammation
...deposits in sub...ous tissue of legs, ...and buttocks	Normal squamous epithelium and sebaceous and sweat glands; calcareous mass in subcutaneous areolar tissue surrounded by dense zone of connective tissue	Wassermann reaction negative; Mantoux reaction negative; blood calcium 9.7 mg.; blood phosphorus 4.4 mg.	No improvement
...ous deposits around the ...er, knee and elbow joints; ...valga affecting knees	.....	Blood calcium 12 mg.; urine normal except for a repeated calcinuria	Progressive stiffening; definite clinical improvement following heliotherapy and roentgen irradiation

TABLE 2.—*Abstracts of Cases of Calcino*

Case	Author	Age	Sex	Possible Etiologic Factors	Duration Prior to Admission	Symptoms and Signs
15	Thibierge, Spillman and Weissenbach	14 yr.	F	Diphtheria followed by serum sickness (2 years prior to onset); scleroderma	6 to 7 yr.	Scleroderma; progressive retraction of tendons upper and lower extremities with marked contractures; palpable nodules over entire body; formation of abscesses with ulceration and discha
16	Wilens and Derby	5 yr.	M	.....	2½ yr.	Weakness; unsteadiness; inability to walk (2½ painless subcutaneous nodules palpable in extremities, shoulders and buttocks (2 yr.); infla tion, necrosis, spontaneous ulceration with extrusion of chalky discharge; swelling and tenderness of left knee
	Follow-up report 5 years later by Bauer, Marble and Bennett	10½ yr.	..	.....	8 yr.	Fixation of hips, knees and elbows due to calc deposits in tissues around joints; formation new calcareous deposits at various sites from time to time, with breaking down of old nodules and extrusion of calcific material
17	Bruusgaard.....	15 yr.	F	Pulmonary tuberculosis; scleroderma	.....	Scleroderma of face and body; swelling of ha hands and feet; pain in joints; palpable nod in knees, thighs, elbows, hands and angles mouth; physical signs of active pulmonary tuberculosis
18	de Fine Licht....	4 yr.	F	.....	.....	Pain and weakness in legs; lassitude; palpab masses in left hand and soles of feet; ulce tion with discharge
19	Aisenberg.....	6 yr.	F	Malaria 4 months prior to onset (1 year duration)	2 yr.	Stiffening of joints; inability to walk; palpab nodules widespread, particularly around join necrosis, ulceration with discharge; suppura
20	Kennedy (1929)...	6 yr.	F	Scleroderma	2 yr.	Instability and difficulty in walking; palpab nodules in skin and soft tissues of elbo axillae, popliteal spaces and back
	Follow-up report (Kennedy 1932)	9½ yr.	..	.....	5⅔ yr.	Gait improved; no limitation of motion; mark clinical improvement; skin over affected parts mal in color and texture
21	Paisseau, Schaeffer and Scherrer	12 yr.	F	Raynaud's disease (5 years); scleroderma	3 yr.	Raynaud's disease; intermittent attacks of ni ness, violaceous color, numbness of hands fo lowed several hours later by redness, heat an smarting pain (most frequent in the winter chronic arthritis with deformity of hands, elbo fingers and left astragaloscaphoid joint; smal calcific deposits palpable bilaterally in popliteal spaces
22	Leréboullet and Lelong	7 yr.	F	Scleroderma; familial incidence of calcinosis (deposit in arm of mother)	6 yr.	Palpable, painless nodules in left leg noted sin beginning to walk at 13 mo.; manifestations of scleroderma; subsequent appearance of nodu in left foot and in abdomen
23	Friedländer.....	11½ yr.	F	Trauma to spine at 1½ years of age	9½ yr.	Hard nodules palpable at first in lower extremit later in arms and trunk and finally over ent body; necrosis and ulceration, with chalky d charge
24	Craig and Lyall	5 yr.	F	No scleroderma	1 yr.	Pain, fever and swelling of legs for 3 mo. (1 prior to appearance of nodules) followed b muscular weakness, stiffness of legs and drag gait; masses palpable under the skin of th extremities and left malar region
25	Forster and Swanson (1931)	3 mo.	F	.....	6 wk.	Hard plaques noted in subcutaneous tissue of b buttocks and both thighs at 6 wk. of age
	Follow-up report by Swanson, Forster and Iob (1933)	8 mo.	..	.....	6½ mo.	No nodules palpable on physical examination 8 mo. of age

ncy and Childhood Reported in the Literature—Continued

Roentgen Examination	Biopsy	Laboratory	
.....	Calcareous deposit in subcutaneous tissue; no degeneration	Calcium carbonate noted on chemical analysis of discharge; innoculation of guinea-pig with biopsy tissue did not cause tuberculosis in the animal; cultures sterile	No improvement
ltiple calcareous deposits subcutaneous tissue of xtremities and within left nee joint	Deposits of lime surrounded by fibrous and adipose tissue; lime salts between fat cells and in periphery of fat cells; dense hyaline connective tissue adjacent to altered fat; no fat necrosis; hyaline degeneration of subcutaneous tissue; obliterating endarteritis	Calcium phosphate and calcium carbonate noted on chemical analysis of biopsy tissue; Wassermann reaction negative; cutaneous tuberculin reaction negative; calcium and phosphorus content of the blood normal	No improvement
lcific deposits in arms, legs ttocks and axillae; none ithin joints	Histologic examination of nodule similar to findings observed 5 yr. previously, except for more numerous foreign body giant cells and more complete encapsulation with fibrous tissue; no antecedent necrosis of tissue; no evidence of chronic inflammation	Chemical analysis of nodule revealed residual calcium and phosphorus ratio 1.87 similar to that found in normal bone (1.94) and to values (1.8 to 2.0) observed in pathologic calcification in man; calcium and phosphorus concentrations in the blood normal	No improvement
posits in joints of left hand, stal end of forearm, arms nd tendon sheaths; tuberalous lesions in lungs	Calcific deposits on histologic examination; no evidence of degeneration	Blood normal	Death 1 yr. after admission, from extension of pulmonary tuberculosis
posits in feet along metarsal bones and soles	Calcific deposits; no necrosis or degeneration	.....	No improvement
posits near large joints houlder, elbow), in the xtremities, thorax, coccyx, lvis and spine	Calcification on histologic examination of nodule excised for biopsy	Blood calcium 9.5 mg.	Some improvement in function of joint resulted after 4 mo. of electrotherapy
posits in arms, forearms, xillae, knees and lower part f pelvis	.....	Blood calcium 10.8 mg.; blood phosphorus 4.2 mg.	Marked improvement in walking and lessened stiffness of joints after 3½ mo. of ketogenic diet
posits disappeared save for few small ones	.....	Blood calcium 11.4 mg.; blood phosphorus 5.1 mg.; no anemia	Clinical improvement and clearance shown in roentgenogram; excellent result following the use of ketogenic diet for 3½ yr.
posits in soft parts of both opliteal spaces only; decalcifiation of bones; no deposits joints; deformity and egularity of articular surfaces of joints seen in roentgenogram	None	Wassermann reaction negative	Progressive emaciation and weakness, with progressive deformity due to reaction of tendons and arthritis deformans; no improvement
posits in left leg, between the tarsal bones of the left foot, in the abdomen and in the suboccipital region	None	Wassermann reaction negative; blood calcium 11.3 mg.; cholesterol, 207 mg.	No improvement
.....	.....	Blood calcium 10.3 mg.; basal metabolic rate +24.6	No improvement
lcific deposits in legs, thighs, rms and left malar region	.....	Wassermann reaction negative; blood calcium 10.2 mg.; blood phosphorus 3.92 mg.	Excellent result following oral administration of di-sodium hydrogen phosphate for 6 wk.; masses reduced in size from "lumps" to "just palpable"; shadows noted in previous roentgenograms had disappeared
lcific deposits in soft parts om crest of ilium on both des extending downward to low knees	None	Blood calcium 10.7 mg.; cholesterol 108 mg.; retention of calcium and phosphorus noted on metabolic studies	No improvement on discharge after 6 wk. of observation
Complete absorption of former calcific deposits seen in roentgenogram	.....	Blood calcium 10.2 mg.; Wassermann reaction negative	Spontaneous cure at 8 mo. of age; total duration, 6½ mo.

TABLE 2.—*Abstracts of Cases of Calcin*

Case	Author	Age	Sex	Possible Etiologic Factors	Duration Prior to Admission	Symptoms and Signs
26	Grenaud and Lescoeur	9 yr.	F	No scleroderma	4 yr.	Palpable nodules first noted in abdomen and observed to be widespread over the entire bo at 5 yr. of age; an acute febrile illness of 2 duration followed, resulting in desquamation the skin and in the disappearance of nodu reappearance of subcutaneous nodules 3 yr. (9 mo. prior to admission), with necrosis ulceration; fixation of elbows and ankles; ma weakness
27	Remy-Roux.....	7 yr.	F	No scleroderma	4 yr.	Weakness; disturbance of gait; difficulty in wa up stairs; motion painful; palpable nodules entire body except head; numerous scars follo ulceration and extrusion; ankylosis and cont tures of fingers, hips, knees and ankles
28	Grulee.....	2½ yr.	M	.....	1 yr.	Pain in left leg for 1 yr.; palpable, hard, ten masses in legs, thighs, hips, trunk (especially pelvis), buttocks, arms and axillae; skin adh in some areas
29	Von Bernuth..... (case 2)	12 yr.	M	Scleroderma with sclerodactylia	3 yr.	Stiffness of joints and legs, with interferenc motion especially marked in joints of hand palpable nodules in hands; necrosis and ulcera
30	Gaté, Michel and Thévenon	9 yr.	F	Myositis ossificans; scleroderma not present	Several months	Palpable nodules under skin of thighs; poste group of thigh muscles and muscles of left ar increased in volume and painful and hard a pressure; limitation of function and fixation elbows, knees and hips
31	Jacobowitz.....	4 yr.	F	Pertussis at 1 year; measles at 4 years	2 yr.	Difficulty in walking; disturbance in gait; weak ness and progressive emaciation; palpable no observed for 2 mo. prior to admission follo by formation of abscesses and ulceration; no over entire body, shoulders, axillae, clavicul regions, arms, abdomen, back, both inguina regions, buttocks and popliteal spaces; pain abscessed areas; patient bedridden
32	Hein.....	6½ yr.	F	Measles at 3 years; influenza at 4 years; pertussis at 5 years; chickenpox at 6 years; pneumonia (three attacks) from 3 to 5 years	4 yr.	Difficulty in walking; stiffening of joints for yr., with limitation of motion in ankle and el joints; painful indurated masses in axillae, a and thighs and along Achilles tendon; necro followed by spontaneous ulceration and dischar
33	Walker.....	14 yr.	F	Raynaud's disease	4 yr.	"Gatherings" of finger-tips for 6 mo.; "gather then disappeared; bluish intermittent discolora and cyanosis of fingers developed, and on o occasion, toe became dead white for a few m utes (Raynaud's disease); palpable nodules finger-tips, palms, left wrist, left big toe and fourth toe; ulceration
34	Turpin, Brun and Guillaumin	14 yr.	F	Myositis ossificans; no scleroderma	9 yr.	Onset at 5 yr. of age of acute febrile illness (fev sweating, pain, vomiting, diarrhea), with gen ized swelling for 5 wk.; followed by pain for 1 fracture of femur at 6½ yr.; palpable nodules upper and lower extremities, trunk and abdo necrosis and ulceration with discharge
35	Rudolph.....	9 yr.	M	Chickenpox at 3 years; pertussis at 5 years; pneumonia at 5 years; measles at 6 years; dermatomyositis	4 yr.	Fever; muscular pain, with progressive muscul weakness; contractures with limitation of mot at wrist, elbows, hips, fingers and jaw; inabil to walk or to flex arms; puffiness of face and lids; palpable nodules over entire body for 1 especially in axillae, buttocks and neck; ulcer of elbow

...cy and Childhood Reported in the Literature—Continued

...Roentgen Examination	Biopsy	Laboratory Observations	Comment
...cific deposits in arms, ...ghs and inguinal regions, ...er anterior superior iliac ...ne and in abdominal wall; ...osits in abdomen so ...ensive as to appear like ...irass	Low power magnification: small, whitish, regular granules of calcium deposited in subcutaneous tissue	Chemical analysis of biopsy tissue revealed the presence of calcium phosphate and of calcium carbonate in ratio of 3:1; red blood cells 2,660,000; white blood cells 16,600, with 63 per cent polymorphonuclears	No improvement; broken-down local abscesses necessitating incision and drainage
...cific deposits in legs, arms, ...k, infraclavicular region ...d over entire body except ...ad	None	.....	No improvement
...cific deposits in numerous ...as in lower extremities	Areas of darkly staining material impregnated with calcium and surrounded by fibrous connective tissue	Blood calcium 11.8 mg.	No improvement noted on follow-up examination 8 mo. later
...careous deposits in both ...nds only	Histologic examination of skin revealed evidences of scleroderma	Calcium carbonate and calcium phosphate noted on chemical analysis of discharge; blood calcium 9.9 mg.; blood phosphorus 4.7 mg.	No improvement; incision and drainage of broken-down, necrotic area
...cific deposits in upper and ...er extremities, especially ...left leg; bony laminae along ...dinous insertion of muscles ...yositis ossificans)	Calcific mass in subcutaneous tissue; no evidence of necrosis or degeneration	Wassermann reaction negative; blood calcium 9.4 mg.	No improvement; clinical appearance of face, etc., suggestive of congenital syphilis, but Wassermann reaction negative
...cific deposits in soft tissue ...extremities, especially in ...ghs and arms and around ...ows; coxa valga	None	.....	Ketogenic diet for 2 mo. and oral administration of di-sodium hydrogen phosphate for 6 wk. unsuccessful; followed by 8 mo. period of repeated abscess formation in arms, axilla, thorax, back, thighs and legs, necessitating incision and drainage; 14 mo. after admission, roentgen examination revealed disappearance of deposits noted in previous roentgenogram; apparently a spontaneous cure had followed the extrusion of calcareous material from the incised abscess
...cific deposits in both gluteal ...ions, thighs, knees, calf ...both legs, arms and ...iliae	Marked infiltration of calcium arranged in globules of varying size; connective tissue swollen and necrotic in places; occasional giant cell containing calcium granules	Blood calcium concentration on admission, 16 mg.; 4 mo. later, 11 mg.; 6 mo. later, 10 mg.; 11 mo. later, 10.8 mg.; Wassermann reaction negative; no anemia; Pirquet test negative	Heliotherapy and irradiation with quartz mercury vapor arc lamp for 4 yr. resulted in gradual disappearance of masses and indurated areas; roentgenogram showed similar disappearance of deposits; biopsy 3½ yr. after admission showed numerous giant cells filled with granules of calcium and deposits consisting of minute granules of calcium instead of masses
...cific deposits only in ...nds and feet; rest of body ...ntgenographically normal	None	Blood calcium 12.8 mg.	No improvement
...cific deposits in trunk, ...iliae, abdomen, elbows, ...pliteal spaces, thigh, calves ...legs; fine, grayish lines of ...ne formation in body of ...uscles (myositis ossificans)	Calcareous mass surrounded by thick shell of connective tissue; fibrosclerosis and collagen repair of connective tissue secondary to inflammatory reaction	Wassermann and tuberculin reactions negative; blood calcium 10.6 mg.; calcium carbonate and calcium phosphate noted on chemical analysis of nodule; red blood cells 2,810,000; hemoglobin content 55 per cent	Progressive weakness until finally cachexia resulted; secondary infection of ulcerated areas; death 4 mo. after admission; no necropsy
...cific deposits in regions ...neck, shoulders, hips and ...vis	Bonelike substance embedded in a fibrous matrix; predominance of dense connective tissue associated with a few round cells and plasma cells; considerable amount of fat and a large number of hyaline bodies, many of which had undergone calcification	Wassermann reaction negative; blood count normal	Ketogenic diet and ammonium chloride therapy unsuccessful; 6 mo. after admission, infection of several ulcerated, necrotic areas resulted in fever and pain for 2 mo.; marked improvement was observed 1 yr. after admission, with disappearance of large nodules and increased motor activity, which was considered to have been brought about by the ketosis presumably occurring during the course of the preceding febrile illness of 2 mo.

TABLE 2.—*Abstracts of Cases of Calcin*

36	Brooks (case 1)..	15 yr.	F	Pertussis, chickenpox and measles before 5 years of age	5 yr.	At 10 yr., disability, pain, swelling of arms and at 12 yr., increasing disability and inability walk, painful swellings of forearms, fingers, and calf of legs but no edema; at 13 yr., ulce of patellae; additional calcific deposits noted roentgenogram; on admission to hospital, sh ulcers on knees and elbows; limitation of mo at hips, knees, fingers, wrist and elbow joints weakness; disturbance of gait; no edema; pa nodules in fingers, forearms, arms, buttock thighs and submental region; deep masses thighs, popliteal spaces, buttocks and areas elbows
37	Rothstein and Welt (case 1 of present report)	5 yr.	M	Dermatomyositis	1½ yr.	Acute febrile illness of 2 wk. with pain in legs, ing of arms and legs, edema of face render mastication difficult and pain on motion (der tomyositis); 9 mo. later, recurrence of pain a swelling in left hand and both feet; on adm sion (18 mo. after onset): swelling of right h palpable nodules near both greater trochant in buttocks and in fourth metatarsal interspa both feet
		12 yr.	..	.....	9 yr.	Admission 2 (at end of 9 yr. of illness): pain tender swelling of left wrist; general condi good; no deformity; patient could walk, run play normally
38	Rothstein and Welt (case 2 of present report)	10 yr.	F	Dermatomyositis	4 mo.	Pain in legs and arms at onset, followed by sw of one arm and of the forearm of the other generalized edema; muscular atrophy; contrac of elbows and hips; 3 wk. after admission t Mount Sinai Hospital, swelling of eyelids, fol by the appearance of palpable nodules in bu tocks and in upper and lower extremities
		11 yr.	..	Dermatomyositis; pulmonary tuberculosis	16 mo.	At Montefiore Home, progressive loss in weight weakness; contracture of joints (elbows, hips, knees, ankles and jaws); mastication difficult d to limitation of motion of jaws; palpable nod began to appear in soft parts of upper and lo extremities, in neck and in buttocks; patient b ridden; tenseness of skin more marked; nodul increased in number accompanied by severe pa in extremities
39	Rothstein and Welt (case 3 of present report)	6 yr.	M	....	1 yr.	Admission 1, right equinovarus without pain fo 1 yr.; abscess of right thigh; spontaneous in ation followed by extrusion of chalky discha
		8 yr.	..	....	3 yr.	Admission 2, progressive weakness and deformity right lower extremity; inability to walk; pain nodules in axillae, thighs, abdomen and legs tenderness and swelling in axilla (abscess)
		10 yr.	..	.....	5 yr.	Admission 3, increasing contractures of joints; muscular atrophy; palpable nodules as on pre vious admission
		15 yr.	..	.....	10 yr.	Admission 4, 5 yr. interval history of numerous recurrent abscesses, followed by spontaneous ulceration and discharge; healing with resultant scars; progressive weakness and emaciation; m tracture deformities; patient bedridden

cy and Childhood Reported in the Literature—Continued

ific deposits at site of ies and masses in upper lower extremities, but- s and submental region; nvolvement of viscera; no ification of bones or sits within joints; bones atrophy of disuse	Two nodules removed: (1) ulcerated nodule, calcareous deposit in thick mass of fibrous tissue with surrounding area of hyaline degeneration and patchy deposition of lime in degenerated collagen; (2) other nodule, masses of calcareous material in cutis and fibrosed subcutaneous tissue, few islands of fat cut off by calcified collagen fibers, most of calcium surrounded by fibrous connective tissue only, but at edges of most recent deposition a well marked inflammatory reaction with foreign body giant cells; no fat necrosis	Wassermann reaction negative; blood calcium 12.2 mg.; blood phosphorus 7.67 mg.; phosphatase index, 0.331 units; blood count, normal; urine, normal except for transient albuminuria with white blood cells; basal metabolic rate, +5.1	Di-sodium hydrogen phosphate given orally for 1 yr.; marked progressive reduction of deposits observed on both physical and roentgen examination; marked clinical improvement noted on examinations 2 mo. and 1 yr., respectively, after institution of therapy; washing out of calcium from the long bones during the administration of di-sodium hydrogen phosphate not observed in roentgenograms
ific deposits in metatarsal rspaces of both hands and ar first phalanx of second, d and fifth fingers of left d	Calcific deposits in subcutaneous tissue, surrounded by giant cells; no evidence of fat necrosis or of degenerative changes	Wassermann reaction of blood and spinal fluid negative; retention of calcium and magnesium noted on metabolic studies	No improvement during next 7 yr.; recurrence of localized abscesses at different sites, with spontaneous ulceration and extrusion of calcareous material followed by slow healing of ulcer and of sinus to leave scar
calcific deposit at distal of left radius; almost plete disappearance of er deposits from left d; diminution in size of osits in right hand	.....	.....	Improvement; roentgenograms showed absorption of calcific deposits in left hand and less so in right hand, with only one new deposit in left wrist; patient walks, runs and plays normally
month after admission, no dows of calcific deposits roentgenogram; 10 mo. after mission, calcific deposits the hips and inner aspect thighs	Biopsy of muscle tissue made to rule out trichinosis in view of eosinophilia and swelling of eyelids 3 wk. after admission but trichinae not found; biopsy of nodule not made	Wassermann reaction negative; Pirquet reaction positive; blood calcium and phosphorus normal; blood count showed anemia and leukocytosis, with eosinophilia from 8 to 10 per cent; retention of calcium and phosphorus noted on metabolic studies	Progressive weakness; contractures of elbows, hips, ankles and knees; muscular atrophy; patient transferred to Montefiore Home for treatment of chronic condition, having been at Mount Sinai Hospital for 1 yr.
nsive calcific deposits in hs, legs, upper part of arms forearms; an occasional osit in hands, feet, hips, ulk and neck; tuber- us infiltration in apex ft lung and in bronchial ph nodes	.....	.....	Death from terminal pneumonia 17 mo. after admission to Montefiore Home; total duration of illness, 3 yr.; necropsy revealed dermatomyositis; degenerative changes in skin, muscles and fibrous connective tissue; calcific deposits in degenerated fibrous connective tissue but not in degenerated muscle; tuberculosis of lung and bronchial lymph nodes
made	Examination of tissue excised at operation showed inflamed granulation tissue, with calcific deposits	.....	Exploratory incision and drainage; calcareous material obtained, but diagnosis not made
nsive calcific deposits in acic wall, left axilla, abdominal wall and th thighs	Examination of tissue excised at operation showed chronic inflammatory tissue, with calcific deposits	Calcium phosphate and calcium carbonate noted on chemical analysis; Wassermann reaction, negative; tuberculin tests, negative; blood calcium 11.7 mg.; retention of calcium noted on metabolic studies	Recurrent abscesses, some ulcerating spontaneously, with discharge of contents, others requiring incision and drainage; suppuration; treatment by diet high in phosphorus and low in calcium and by oral administration of di-sodium hydrogen phosphate unsuccessful
mprovement on roentgen mination	.....	Blood calcium 8.4 mg.; blood phosphorus 4 mg.; anemia	Ketogenic diet (ratio 1:4) for 10 wk.; no clinical or roentgenologic improvement
osits in popliteal space, gs, legs, hips and pelvis; osits noted 7 yr. before in side of abdomen had dis- ared	.....	Calcium carbonate noted in lining of sinus tract on chemical analysis of the tissue; mild anemia; blood calcium 9.5 mg.; blood phosphorus 5.0 mg.; cholesterol, 160 mg.	Follow-up visit 1 yr. later; no improvement; contractures more marked; emaciation; total duration of illness, 11 yr.

was subsequently reported under the title of calcinosis circumscripta by Swanson, Forster and Iob, we have classified these two borderline cases similarly, for in Rabère and Leuret's case only the upper extremities were involved (both forearms), and in Paisseau, Schaeffer and Scherer's case only the lower extremities were involved (both popliteal spaces). Nevertheless, in Rabère and Leuret's case the hands were not involved, as in the definite cases of calcinosis circumscripta reported by Schramek and by von Bernuth; likewise, in the cases of Forster and Swanson and of Paisseau and his co-workers the feet were not involved, as in the definite case of calcinosis circumscripta reported by de Fine Licht. Consequently, it is difficult to know in which of the two divisions of calcinosis such borderline cases belong. Moreover, it is obvious that different observers might classify such cases differently.

Furthermore, one cannot state with complete assurance that the condition termed calcinosis circumscripta is independent of, and a separate entity from, that referred to as calcinosis universalis. One cannot disregard the possibility that the underlying process, which caused the local calcification limited to the hands and feet in cases of calcinosis circumscripta, may in future years bring about a more extensive deposition of lime elsewhere in the body. In our opinion the two syndromes are not sufficiently different from each other to necessitate their division into separate entities, and such a classification seems artificial and confusing. It is possible that the two forms are merely different stages of the same process and, in view of the remissions and exacerbations which occur in the disease, may follow one another. We have therefore grouped all the cases of calcinosis together in the series reported here, and the differentiation into the two types has been made merely as a concession to the terminology used elsewhere in the literature.

In the attempt to analyze and evaluate the data presented in the abstracts of the cases from the literature, enumeration can be made only of the number of cases in which any one factor has been stated to be present, for some of the reports are brief and incomplete, whereas, in others a particular individual symptom or finding may not be specifically referred to. Table 3 represents a schematic arrangement of the data obtained from the reports of the 39 cases of our series, which has been reduced to this simple form for more convenient analysis.

Possible etiologic factors were referred to in two thirds of the reports in the series (26 of the 39 cases); none were mentioned in the remaining third of the reports (13), except that in 4 of the latter group scleroderma was stated to be absent. Severe rickets was reported in 1 case (Schulze). Trauma was noted in 2 cases (7.7 per cent), in 1 of which it was associated with the additional factors of scleroderma, chronic rheumatic infection and dermatomyositis (Dietschy), whereas in the other trauma was present alone (Friedländer). Scleroderma was

observed in 11 cases (42.3 per cent). In 6 of the cases the scleroderma appeared as the sole etiologic agent (Zarfl; Langmead; Tisdall and Erb, case 2; Kennedy; Lereboullet and Lelong; Rothstein and Welt, case 3), and in each of the remaining 5 cases the scleroderma occurred in association with different factors (Dietschy, chronic rheumatic infection, trauma and dermatomyositis; Thibierge, Spillman and Weissenbach, diphtheria followed by serum sickness; Bruusgaard, pulmonary tuberculosis; von Bernuth, sclerodactylia; Paisseau, Schaeffer and Scherrer, Raynaud's disease).

Dermatomyositis occurred in 3 cases (11.5 per cent), appearing alone in our first case, in association with the previously mentioned factors in Dietschy's case and in association with pulmonary tuberculosis in our second case. Myositis ossificans was present as the sole etiologic factor in 2 cases (7.7 per cent), in both of which scleroderma was reported to be absent (Gaté, Michel and Thévenon; Turpin, Brun and Guillaumin). Raynaud's disease was present in 2 cases (7.7 per cent), being the sole factor in one case (Walker) and occurring in association with scleroderma in the other (Paisseau, Schaeffer and Scherrer).

Infection played a rôle in 9 cases (34.6 per cent). It was noted as the sole factor in 7 cases, being present as a single infection in 2 cases (Morse, influenza; Aisenberg, malaria) and as one of multiple infections in 5 cases (Weber, scarlet fever, diphtheria, pneumonia and otitis media; Jacobwitz, pertussis and measles; Hein, measles, influenza, pertussis, chickenpox and pneumonia; Rudolph, chickenpox, pertussis, pneumonia and measles; Brooks, pertussis and chickenpox). In the remaining 2 cases infection occurred in association with scleroderma (Dietschy, chronic rheumatic infection; Thibierge, Spillman and Weissenbach, diphtheria).

Pulmonary tuberculosis was considered of etiologic significance in 2 cases (7.7 per cent), in 1 in association with scleroderma (Bruusgaard) and in the other, with dermatomyositis (Rothstein and Welt, case 2). Syphilis was not proved in any of the cases in children. Although congenital syphilis at first had been suspected from the clinical appearance in 1 case (Gaté, Michel and Thévenon), the Wassermann reaction was negative.

To summarize, the most important factors of possible etiologic significance in the production of calcinosis in order of their frequency in this series are: scleroderma (42.3 per cent), infection (34.6 per cent), dermatomyositis (11.5 per cent), myositis ossificans (7.7 per cent), Raynaud's disease (7.7 per cent), pulmonary tuberculosis (7.7 per cent), trauma (7.7 per cent) and severe rickets (3.8 per cent). In 19 of the 26 cases in which the possible etiology was mentioned, the aforementioned factors occurred as the sole agent; in the remaining 7 cases they occurred in combination with each other.

TABLE 3.—*Calcinosis in Infancy and Childhood: Analy*

Case	Author	Year Reported	Type of Calcinosis: Universalis	Type of Calcinosis: Circumscripta	Age	Sex	Possible Etiologic Factors: Scleroderma	Dermatomyositis	Infection	Tuberculosis	Trauma	Other Factors	Duration Prior to Admission	Symptoms and Signs: Pain	Weakness	Disturbed Gait or Balance	Stiffening	Palpable Nodules	Ulceration	Tissues Involved: Skin	Subcutaneous Tissue	Joints by: Bones	Contractures	Calcific Deposits	Extremities: Upper	Extremities: Lower
1	Curtillet and Dor	1898	U	..	8 yr.	♀	..	..	..	..	..	.....	2½ yr.	..	..	..	..	+	+	+	+	..	..	..	+	+
2	Timaschoff and Romanoff	1906	U	..	8 yr.	♂	..	..	..	..	..	.....	.....	..	..	..	..	+	..	+	+	..	..	..	+	+
3	Dietschy	1907	U	..	12 yr.	♀	+	+	+	..	+	.....	1¾ yr.	+	++	+	+	..	+	+	+	..	+	..	+	+
4	Rabère and Leuret	1908	..	C	6 yr.	♂	..	..	..	..	..	.....	2½ yr.	+	..	..	..	+	..	+	+	..	0	..	+	..
5	Carles	1912	U	..	6 yr.	♂	0	..	..	..	..	.....	3 yr.	..	..	..	+	..	..	+	+	..	+	..	..	+
6	Weber	1913	U	..	7 yr	♀	..	..	++++	..	..	.....	1 yr.	..	..	..	..	+	+	+	+	..	..	..	+	+
7	Zarfl	1914	U	..	7 wk.	♀	+	..	..	..	..	.....	6 wk.	..	+	..	+	+	..	+	+	..	..	..	+	..
8	Schramek	1917	..	C	9 yr.	♀	..	..	..	..	..	.....	3 yr.	..	..	..	..	+	+	+	+	..	..	..	+	..
9	Langmead	1918	U	..	4½ yr.	♂	+	..	..	..	..	Mongolism	3-4 mo.	..	+	+	+	+	..	+	+	..	+	..	+	+
10	Morse	1921	U	..	3½ yr.	♀	..	..	+	..	..	.....	1½ yr.	..	+	+	..	+	+	+	+	..	0	..	+	+
11	Czirer	1921	U	..	8 yr.	♂	..	..	..	..	..	.....	1½ yr.	..	..	..	..	+	+	+	+	..	..	..	..	+
12	Tisdall and Erb (case 1)	1924	U	..	5 wk.	♂	..	..	..	..	..	.....	5 wk.	..	++	..	+	0	0	0	0	+	+	0	+	+
13	Tisdall and Erb (case 2)	1924	U	..	12 yr.	♂	+	..	..	..	..	.....	4 yr.	+	++	++	+	+	+	+	+	0	+	..	+	+
14	Schulze	1925	U	..	12 yr.	♂	..	..	..	..	..	++ rickets	8 yr.	..	..	..	+	+	+	+	+	..	+	..	+	+
15	Thibierge, Spillmann and Weissenbach	1925	U	..	14 yr.	♀	+	..	+	..	..	.....	6-7 yr.	..	..	..	+	+	+	+	+	..	+	0	+	+
16	Wilens and Derby	1926	U	..	5 yr.	♂	..	..	..	..	..	.....	2½ yr.	+	++	++	..	+	+	+	+	..	..	+	+	+
17	Bruusgaard	1928	U	..	15 yr.	♀	+	..	..	+	..	.....	.....	+	+	..	..	+	+	+	+	..	..	+	+	+
18	de Fine Licht	1928	..	C	4 yr.	♀	..	..	..	..	..	.....	.....	+	+	+	..	+	+	+	+	..	..	..	+	+
19	Aisenberg	1929	U	..	6 yr.	♀	..	..	+ malaria	..	..	.....	2 yr.	..	+	+	+	+	+	+	+	..	+	..	+	+
20	Kennedy	1929	U	..	6 yr.	♀	+	..	..	..	..	.....	2 yr.	..	+	+	+	+	..	+	+	0	+	0	+	+
	Follow-up report	1932	U	..	9½ yr.	..	+	..	..	..	..	.....	5⅔ yr.	0	0	0	0	Few only	..	0	+	0	0	0	..	..
21	Paisseau, Schaeffer and Scherrer	1930	..	C	12 yr.	♀	+	..	..	..	..	+ Raynaud's disease	3 yr.	+	+	+	+	+	0	+	+	+	+	0	Arthritis deformans lating surface of	
22	Lereboullet and Lelong	1930	U	..	7 yr.	♀	+	Familial incidence for mother had deposit in arm only					6 yr.	..	..	+	..	+	0	+	+	0	0	0	..	+
23	Friedländer	1930	U	..	11 yr.	♀	..	..	..	..	+	.....	9½ yr.	..	..	..	..	+	+	+	+	..	+	..	+	+
24	Craig and Lyall	1931	U	..	5¼ yr.	♀	0	..	..	..	..	.....	1 yr.	+	+	+	+	+	..	+	+	0	+	0	+	+
25	Forster and Swanson	1931	..	C	3 mo.	♀	..	..	..	..	..	.....	6 wk.	..	..	..	..	+	..	0	+	0	0	0	..	+
	Follow-up report by Swanson, Forster and Iob	1933	..	C	8 mo.	..	..	..	..	..	..	.....	6½ mo.	..	..	..	..	0	..	0	0	0	0	0	..	0
26	Grenaud and Lescoeur	1932	U	..	9 yr.	♀	0	..	..	..	..	.....	4 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+

Localization										Laboratory Observations							
Axilla	Trunk	Thorax	Pelvis	Buttocks	Coccyx or Sacrum	Roentgen Observation	Biopsy	Chemical Analysis	Wassermann Test	Tuberculin Tests	Calcium, Mg.	Phosphorus, Mg.	Anemia	Comment	Differential Diagnosis	Treatment	Comment
..	..	..	..	..	..	..	+	..	..	..	..	..	..	.....	Multiple sarcoma	.....	No improvement
..	+	..	..	..	..	..	..	..	..	..	..	..	..	.....	.....	.....	No improvement
..	..	..	+	..	..	+	..	+	..	..	..	..	..	.....	.....	.....	Death; necropsy
..	..	..	..	..	..	+	..	..	..	..	..	..	..	.....	.....	.....	No improvement
+	..	..	+	+	..	..	+	..	..	..	..	..	..	.....	.....	.....	No improvement
..	+	..	+	+	..	+	+	+	..	..	..	..	..	.....	.....	.....	No improvement
..	+	+	..	+	..	..	..	..	..	..	..	..	..	.....	.....	.....	Spontaneous cure
..	..	..	..	..	..	..	..	+	..	..	..	..	..	.....	.....	.....	No improvement
+	..	..	..	..	..	+	..	..	..	..	..	..	..	.....	.....	.....	No improvement
+	..	+	..	+	..	+	+	..	Neg.	Neg.	..	..	..	.....	.....	.....	No improvement
+	..	..	..	..	..	..	+	+	..	..	..	..	..	.....	.....	.....	No improvement
..	..	..	..	..	..	+	0	..	Neg.	Neg.	9.3	4.5	0	.....	.....	.....	Death at 9 weeks of age; necropsy
..	+	..	..	+	..	+	+	..	Neg.	Neg.	9.7	4.4	..	.....	Xeroderma	.....	No improvement
..	..	..	..	..	+	+	..	..	..	..	12.0	..	..	Calcinuria	Tuberculosis of skin	Heliotherapy and roentgen therapy	Improvement
Entire body						..	+	+	..	..	..	..	..	.....	.....	.....	No improvement
..	..	..	..	+	..	+	+	+	Neg.	Neg.	Normal	Normal	..	.....	.....	.....	No improvement
..	..	..	..	..	..	+	+	..	..	..	..	..	0	.....	.....	.....	Death 1 year later of pulmonary tuberculosis
..	..	..	.	..	..	+	+	..	..	..	..	..	..	.....	.....	.....	No improvement
+	+	+	+	..	+	+	+	..	..	..	9.5	..	..	.....	.....	Electrotherapy (4 months)	Improvement
Entire body																	
+	+	.	+	..	+	+	..	..	..	..	10.8	4.2	0	.....	.....	Ketogenic diet	Improvement in 3 months
..	..	..	..	..	..	+	..	..	..	..	11.4	5.1	0	.....	.....	Ketogenic diet (3⅝ years)	Marked improvement clinically; shadows disappeared on roentgenogram
						Slight											
..	..	..	..	..	..	+	0	0	Neg.	..	..	..	..	.....	Rheumatism	.....	No improvement
(with irregularities of articu-																	
bones of joints involved)																	
Abdomen and sub-occipital region						+	0	0	Neg.	..	11.3	..	..	Cholesterol, 207 mg.	.....	.....	No improvement
..	+	..	..	..	..	..	..	..	..	..	10.3	..	..	Retention of calcium and phosphorus	.....	.....	No improvement
Left malar region						+	0	0	Neg.	..	10.2	3.9	..	.....	.....	Di-sodium hydrogen phosphate; 6 weeks	Marked clinical and roentgen improvement in 6 weeks
..	..	..	..	+	..	+	0	..	..	..	10.7	..	0	Retention of calcium and phosphorus	.....	None	No improvement at age of 3 months
..	..	..	..	0	..	Neg.	..	..	Neg.	..	10.2	..	..	Cholesterol, 108 mg.	.....	None	Spontaneous cure shown clinically and by roentgenogram
..	..	..	+	..	..	+	+	+	..	..	..	..	+	.....	.....	.....	No improvement
Abdomen																	

TABLE 3.—*Calcinosis in Infancy and Childhood: Analysis of*

Case	Author	Year Reported	Type of Calcinosis: Universalis	Type of Calcinosis: Circumscripta	Age	Sex	Possible Etiologic Factors: Scleroderma	Dermatomyositis	Infection	Tuberculosis	Trauma	Other Factors	Duration Prior to Admission	Symptoms and Signs: Pain	Weakness	Disturbed Gait or Balance	Stiffening	Palpable Nodules	Ulceration	Tissues Involved: Skin	Subcutaneous Tissue	Bones	Joints by: Contractures	Joints by: Calcific Deposits	Extremities: Upper	Extremities: Lower
27	Remy-Roux	1932	U	..	7 yr.	♀	0	..	..	..	..	.....	4 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
28	Grulee	1932	U	..	2½ yr.	♂	..	..	..	..	..	.....	1 yr.	+	..	+	..	+	..	+	+	0	+	0	+	+
29	von Bernuth	1932	..	C	12 yr.	♂	+	..	..	..	..	+ Sclero-dactylia	3 yr.	..	..	+	+	+	+	+	+	0	+	0	+	..
30	Gaté, Michel and Thévenon	1932	U	..	9 yr.	♀	0	..	..	..	..	+ Myositis ossificans	Several mo.	+	..	+	+	+	0	+	+	0	+	0	+	+
31	Jacobowitz	1932	U	..	4 yr.	♀	..	..	+	..	..	.....	2 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
32	Hein	1933	U	..	6½ yr.	♀	..	..	+	+	+	.....	4 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
33	Walker	1934	..	C	14 yr.	♀	..	..	..	..	..	+ Raynaud's disease	4 yr.	..	..	..	..	+	+	+	+	0	0	0	+	+
34	Turpin, Brun and Guillaumin	1934	U	..	14 yr.	♀	0	..	..	..	..	+ Myositis ossificans	9 yr.	+	+	..	..	+	+	+	+	0	0	0	+	+
35	Rudolph	1934	U	..	9 yr.	♂	..	+	+	+	..	.....	4 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
36	Brooks	1934	U	..	15 yr.	♀	..	..	+	+	..	.....	5 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
37	Rothstein and Welt (case 1)	1935	U	..	5 yr.	♂	..	+	..	..	..	.....	1½ yr.	+	+	+	0	+	+	+	+	0	0	0	+	+
38	Rothstein and Welt (case 2)	1935	U	..																						
		Admission 1			10 yr.	♀	..	+	..	+	..	.....	4 mo.	+	+	+	+	+	0	+	+	0	+	0	+	+
		Admission 2			11 yr.		..	..	+	..	+	..	.....	16 mo.	+	+	+	+	+	0	+	+	0	+	0	+	-
39	Rothstein and Welt (case 3)	1935	U	..																						
		Admission 1			6 yr.	♂	..	..	..	..	..	.....	1 yr.	+	+	..	..	..	+	+	+	..	..	..	..	+
		Admission 2			8 yr.		..	..	..	..	..	.....	3 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
		Admission 3			10 yr.		..	..	..	..	..	.....	5 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+
		Admission 4			15 yr.		..	..	..	..	..	.....	10 yr.	+	+	+	+	+	+	+	+	0	+	0	+	+

Data from Reports of 39 Cases in the Literature—Continued

Localization									Laboratory Observations								
Axilla	Trunk	Thorax	Pelvis	Buttocks	Coccyx or Sacrum	Roentgen Observation	Biopsy	Chemical Analysis	Wassermann Test	Tuberculin Tests	Calcium, Mg.	Phosphorus, Mg.	Anemia	Comment	Differential Diagnosis	Treatment	Comment
..	..	+	..	..	..	+	0	..	....	....	....	....	..	.....	.....	.....	No improvement
Entire body																	
-	+	..	+	+	..	+	+	..	..	..	11.8	..	..	.....	.....	.....	No improvement
..	..	..	..	..	..	+	+	+	Neg.	Neg.	9.9	4.7	0	.....	.....	.....	No improvement
..	..	..	..	..	..	+	+	..	Neg.	..	9.4	..	..	.....	Congenital syphilis	.....	No improvement
-	+	+	+	+	..	+	0	..	..	..	..	..	..	.....	.....	Ketogenic diet and di-sodium hydrogen phosphate	Treatment unsuccessful; no improvement
Entire body														.....	.....	Following ulceration or incision, deposits were extruded	14 months after admission, disappearance of roentgen shadows noted
+	..	.	..	+	..	+	+	..	Neg.	Neg.	16.0	..	0	.....	.....	Heliotherapy and irradiation from quartz mercury vapor arc lamp over 4 year period	Marked improvement; gradual disappearance of roentgen shadows
..	..	..	..	..	..	+	0	..	..	..	12.8	..	..	.....	.....	.....	No improvement
-	+	Abdomen				+	+	+	Neg.	Neg.	10.6	..	+	.....	.....	.....	Death 4 months after admission in cachexia
-	+	..	+	+	..	+	+	..	Neg.	..	..	..	0	.....	.....	Ketogenic diet and ammonium chloride	Both methods abandoned; lack of cooperation
Neck; entire body																Febrile reaction to suppuration of necrotic abscesses for 2 months acted to cause ketosis	Ketosis of febrile period may have caused absorption of calcium, for many deposits had disappeared; condition improved
..	..	..	..	+	..	+	+	+	Neg.	..	12.2	7.6	0	Phosphatase index, 0.331 units	.....	Di-sodium hydrogen phosphate orally for 1 year	Marked improvement; reduction in deposits on physical and roentgen examination
Submental region																	
..	..	..	..	+	..	+	+	..	Neg.	..	Normal	Normal	+	Retention of calcium and phosphorus	Trichinosis	Spontaneous ulceration of necrotic areas with extrusion over 7 year period	Improvement; deposits absorbed or extruded, for roentgenograms showed disappearance of some deposits and diminution in size of others
..	..	..	.	+	..	+	0	0	Neg.	+ von Pirquet	Normal	Normal	+	Retention of calcium and phosphorus	Trichinosis; scleroderma; myxedema; neurodermatomyositis	.....	No improvement
-	+	..	..	+	..	..	..	..	..	..	..	..	..	.....	.....	.....	Death of terminal pneumonia; necropsy
neck																	
..	..	..	..	..	..	0	+	0	..	..	..	..	..	.....	Tuberculosis; syphilis; obscure infection	Abscess of thigh incised	Incision and drainage followed by improvement
-	+	Abdomen				+	+	+	Neg.	Neg.	11.7	..	..	Retention of calcium and phosphorus	.....	Incision and drainage of recurrent abscesses	Local improvement (symptomatic)
																Diet high in phosphorus and low in calcium with di-sodium hydrogen phosphate added	No improvement
+	..	..	..	..	..	..	..	..	..	..	8.4	4.0	+	.....	.....	Ketogenic diet	No improvement
..	.	..	+	..	..	+	..	+	..	..	9.5	5.0	+	.....	.....	.....	No improvement

Mention was made of the duration of the symptom complex prior to examination in the reports of 36 of the cases; in the remaining 3 reports the duration was not stated. The duration of symptoms was less than two months in 3 cases, four months or less in 6 cases, between one and two years in 8 cases, between two and four years in 16 cases and five years or more in 6 cases. The average duration of symptoms prior to examination for the entire series was approximately three years; the shortest period was ten days (Zarfl), and the longest was 9 years (Friedländer).

The course was chronic in all cases. The shortest course was six and one-half months (Swanson, Forster and Iob), and the longest was over ten years (Rothstein and Welt, case 3). Definite remissions and exacerbations occurred in 2 of the cases, with intervals of approximately three years during which the patient was free from symptoms in both cases (Grenaud and Lescoeur; Walker).

The earliest symptoms mentioned in this series frequently consisted of the following sequence: an acute febrile illness, stiffening of the joints, development of contractures and disturbances in gait or balance. This was more often the sequence when scleroderma or dermatomyositis preceded the calcinosis. By the time nodules or masses were palpable in the skin or subcutaneous tissue, the calcinosis was well advanced. Occasionally, the first real indication of the calcinosis was the appearance of a local abscess resulting from the breaking down of the subcutaneous tissue around the calcific deposit (Rothstein and Welt, case 2).

The stated incidence of the various symptoms and signs in this series was: pain, 20 cases; cachexia, 3 cases; emaciation, 4 cases; marked progressive weakness without emaciation or cachexia, 16 cases; disturbance in gait or balance (inability to walk or difficulty in walking; confinement to bed; inability to stand), 23 cases; contractures, 22 cases (stated absent in 2 cases); stiffening of the joints, 22 cases; palpable nodules, 36 cases (stated absent in Tisdall and Erb's first case and not specifically mentioned in Carles' and Dietschy's cases); necrosis, ulceration and extrusion of gritty chalklike material without suppuration, 15 cases (absent in 6 cases), and necrosis and ulceration, with suppuration followed by the spontaneous extrusion of a purulent, as well as gritty, discharge, 10 cases.

The skin was involved in all but 2 cases (Tisdall and Erb, case 1; Forster and Swanson). Of the 37 cases, the skin was involved in 15 cases by necrosis and ulceration without suppuration, in 10 cases by necrosis and ulceration with suppuration, in 11 cases by scleroderma (in only 5 of which ulceration did not occur [Zarfl; Langmead; Kennedy; Paisseau, Schaeffer and Scherrer; Lereboullet and Lelong], whereas, in 6 additional cases scleroderma was stated to be absent) and in 4 cases, by dermatomyositis, in only 1 of which ulceration did not occur

(Rothstein and Welt, case 2); in 6 cases, although the skin was stated to be involved, the character of the involvement was not specified in the report.

The subcutaneous tissue was involved in all the cases except in Tisdall and Erb's first case. The bones themselves frequently suffered atrophic changes due to disuse but were not the seat of calcific deposits save in 1 case (Tisdall and Erb's first case, with calcareous deposits in the epiphyses of the long bones and in the patellae).

The joints were fixed and motion was limited by the development of contractures in 16 cases, and the joints and motion were unaffected in 4 cases. Calcific deposits were present within the joints in only 2 cases (Wilens and Derby, left knee joint; Bruusgaard, joints of the left hand), yet specific reference to the sparing of the joints by calcification was made in the reports of only 22 of the cases. Chronic arthritis deformans caused an irregularity and deformity in the articulating surfaces of the joints in 1 case (Paisseau, Schaeffer and Scherrer), but calcific deposits were not present in the joints.

The extent of the calcific deposits is of interest. The entire body was involved in 5 cases; the neck, in 2; the submental region, in 1; the suboccipital region, in 1; the left malar region, in 1; the thorax, in 5; the trunk, in 12; the axilla, in 12; the abdomen, in 4; the pelvis, in 11; the buttocks, in 13; the sacrum, in 2; the coccyx, in 1; the lower portion of the spine, in 1; both the upper and the lower extremities, without deposits elsewhere, in 6; both the upper and the lower extremities, with deposits at other sites, in 24; the upper extremities alone, with deposits elsewhere, in 1; the upper extremities alone, without deposits elsewhere, in 3; the lower extremities alone, with deposits elsewhere, in 4, and the lower extremities alone, without deposits elsewhere, in 1 case.

A biopsy was made in 21 cases. In 12 cases the lime salts impregnated apparently normal fat or subcutaneous tissue without evidence of inflammation, necrosis or degeneration (Curtillet and Dor; Weber; Tisdall and Erb, case 2; Thibierge, Spillman and Weissenbach; Bruusgaard; de Fine Licht; Aisenberg; Grulee; Grenaud and Lescoeur; von Bernuth; Gaté, Michel and Thévenon; Rothstein and Welt, case 1). In 5 cases evidence of degeneration, hyalinization or amyloid changes in the fat or subcutaneous tissue were observed, with the deposition of the calcium salts at the sites of degeneration (Carles, degeneration, necrosis and diffuse fibrosis; Morse, fatty degeneration; Wilens and Derby, hyaline degeneration; Hein, edema and necrosis of connective tissue; Rudolph, amyloid degeneration). In 2 cases a chronic inflammatory reaction of the connective tissue was present around the calcareous deposits (Czirer; Rothstein and Welt, case 3), while in another case fibrosclerosis and collagen repair of the connective tissue secondary to an inflammatory reaction were noted (Turpin, Brun and Guillaumin).

In the remaining case both hyaline degeneration and evidences of an inflammatory reaction, with foreign body giant cells, were observed (Brooks).

Of the 4 fatal cases reported, necropsy was done in 3. The observations were: Dietschy, atrophy of the skin, calcareous deposits along the tendons, interstitial myositis and perivascular infiltration in the muscles of the heart, bladder and uterus; Tisdall and Erb (case 1), no abnormalities in the viscera save for a patent ductus arteriosus and, on histologic examination of the patella, degenerative changes in the connective tissue cells, with calcareous deposits in the degenerated areas but no evidences of inflammation; Rothstein and Welt, case 2, dermatomyositis, degenerative changes in the fibrous connective tissue, with calcific deposits along the connective tissue fibrils and in the fibrous sheaths of the tendinous portions of the muscles, degenerative changes in the muscle fibers but no calcification in the degenerated muscle fibers, tuberculous abscess of the apex of the left lung, fibrinous pleurisy, tuberculosis of the bronchial lymph node and terminal bronchopneumonia.

Thus, of a total of 24 cases in which histologic examination was made either at biopsy or at necropsy, degenerative changes were observed in the fat or in the connective tissue in 8 cases (33.3 per cent); chronic inflammatory changes were noted in the connective tissue in 6 cases (25 per cent), and no evidence of fat necrosis, of connective tissue degeneration or of inflammatory changes was noted in 11 cases. The muscle was involved in 4 of the aforementioned cases: by myositis ossificans in 2 (Gaté, Michel and Thévenon; Turpin, Brun and Guillaumin), by interstitial myositis in 1 (Dietschy) and by degeneration of the muscle fibers without any calcification of the muscle fibers themselves in 1 (Rothstein and Welt, case 2).

In 11 cases chemical analysis was done either of the nodule obtained for biopsy or of the chalky discharge extruded from a local broken-down area by spontaneous ulceration or by incision and drainage. Calcium carbonate and calcium phosphate were found in varying proportions. Chemical analysis of nodules removed for biopsy in 2 cases revealed concentrations of calcium carbonate and calcium phosphate, as well as a ratio of the one to the other, similar to the observations in normal bone and in pathologic calcification in man (Bauer, Marble and Bennett; Brooks).

Roentgen examinations were made in 31 of the 39 cases in this series. In 30 cases, the calcific deposits were demonstrated in the roentgenogram to be situated in the soft parts. In 2 cases of the latter group additional calcific deposits were demonstrated in the roentgenogram within the joints themselves (Wilens and Derby, within the left knee joint; Bruusgaard, within the joints of the left hand). In the other case roentgen

examination revealed the calcific deposits to be present only in the bones (the epiphyses of the long bones and the patellae in Tisdall and Erb's first case). The condition would assuredly have been unrecognized and even unsuspected had not the roentgenogram been made. For the remaining 8 cases in this series no statement appears in the original report or the quoted abstracts as to whether roentgen examination was made.

The concentration of calcium and phosphorus were determined in 20 and 10 of the cases, respectively. The actual figures were not given in 3 cases, but values were stated as being normal. In only 1 case

TABLE 4.—*Concentrations of Calcium and Phosphorus in the Blood in Cases of Calcinosis*

	Calcium, Mg.	Phosphorus, Mg.
Tisdall and Erb (case 1)	9.3	4.5
Tisdall and Erb (case 2)	9.7	4.4
Schulze	12.0	...
Wilens and Derby	Normal	Normal
5 yr. later (Bauer, Marble and Bennett)	Normal	Normal
Aisenberg	9.5	...
Kennedy—On admission	10.8	4.2
1 yr. later	10.9	4.5
3½ yr. later	11.4	5.1
Friedländer	10.3	...
Craig and Lyall	10.2	3.9
Forster and Swanson	10.7	...
5 mo. later (Swanson, Forster and Iob)	10.2	...
Lereboullet and Lelong	11.3	...
Grulee	11.8	...
Von Bernuth	9.9	4.7
Gaté, Michel and Thévenon	9.4	...
Hein—On admission	16.0	...
4 mo. later	11.0	...
6 mo. later	10.0	...
11 mo. later	10.8	...
Walker	12.8	...
Turpin, Brun and Guillaumin	10.6	...
Brooks	12.2	7.6
Rothstein and Welt (case 1)	Normal	Normal
Rothstein and Welt (case 2)	Normal	Normal
Rothstein and Welt (case 3)		
Admission 1	....	...
Admission 2 (2 yr. after first admission)	11.7	...
2 mo. later	10.0	...
4 mo. later	9.8	5.2
9 mo. later	10.2	4.0
Admission 3 (3¾ yr. after first admission)	8.4	4.0
7 wk. later	10.0	2.6
10 wk. later	7.5	3.0
Admission 4 (9 yr. after first admission)	9.5	5.0
2 wk. later	9.8	5.2

(Hein) was hypercalcemia present (16 mg.), and on subsequent determinations the concentration was found to be reduced to within normal limits. Subnormal values were not obtained except for transient hypocalcemia during the third admission of our second patient, while he was on the ketogenic diet. The values for calcium and for phosphorus are given in tabular form (table 4) for purposes of clarity.

A Wassermann test was made in 17 of the cases, and the reaction was negative in all instances. Cutaneous tests with tuberculin (either Pirquet or the Mantoux test, or both) were made in 9 cases; a positive reaction was noted in only 1 case, in which at necropsy pulmonary tuber-

culosis with caseation was noted (Rothstein and Welt, case 2). In the only other case in which pulmonary tuberculosis was present (Bruusgaard) the cutaneous reaction of the tuberculin test was not reported.

The blood count was referred to in 14 cases. In 9 of these anemia was not present; in the remaining 5 cases, anemia of some degree was observed. Metabolic studies were carried out in 5 cases, in all of which a retention of calcium and phosphorus was noted.

Among the various conditions considered in a differential diagnosis, the following may be mentioned: multiple sarcoma, xeroderma, tuberculosis of the skin, "cold abscess," rheumatism, congenital syphilis, suppurative abscesses of obscure etiology or from a cryptogenic focus, scarlet fever, myxedema and other glandular dyscrasias, chronic nephritis and trichinosis. During observation a great variety of diagnoses must have been suggested for the various cases which were not even mentioned in the individual reports.

Four patients died while under observation, and 35 were living at the time the report of the case was made. Of the 4 who died, Dietschy's patient died in extreme cachexia, and no other cause of death was given; in Tisdall and Erb's first case, the cause of death was not stated and all the organs were found normal at necropsy except for a patent ductus arteriosus; in Bruusgaard's case, the child died of an extension of pulmonary tuberculosis, and in our second case, death took place in the midst of an asphyxial attack while the patient was attempting to swallow food and at necropsy terminal bronchopneumonia and a caseated tuberculous abscess of the lung were noted.

Of the 35 patients living at the time the reports were written, 25 were unimproved and 10 were definitely improved or were entirely cured, judged by physical signs and results of roentgen examination. Spontaneous recovery occurred in 1 patient (Swanson, Forster and Iob) at the age of 8 months after a total duration of illness of six and one-half months; no treatment had been given. In 2 cases (Jacobowitz; Rothstein and Welt, case 1) disappearance of the calcific deposits with resultant clinical improvement occurred within fourteen months and eight years, respectively, as the result of the extrusion of the calcareous material, either by spontaneous ulceration or by means of surgical incision and drainage of localized abscesses involving the subcutaneous tissue at the sites of the abnormal deposits. In 1 case (Rudolph), although the administration of the ketogenic diet and of ammonium chloride to cause acidosis were unsuccessful, definite clinical and roentgen evidence of improvement resulted after a two months' febrile illness secondary to an infection of the ulcerated, necrotic areas. The author suggested that a more or less constant ketosis was probably present as a result of the fever during the two months' period and that the ketosis caused an absorption of the calcium from the deposits. In 2 cases

(Craig and Lyall; Brooks) di-sodium hydrogen phosphate was administered orally for periods of six weeks and of over one year, respectively, with an excellent result. In 1 case (Kennedy) clinical cure and roentgen evidence of disappearance of the calcific deposits were obtained by the administration of the ketogenic diet for three and one-half years. In the 3 remaining cases, definite clinical improvement and roentgen evidence of clearance were reported following heliotherapy and roentgen irradiation in Schulze's case, after four months of electrotherapy in Aisenberg's case and after four years of continuous courses of heliotherapy and of irradiation from a quartz mercury vapor lamp in Hein's case.

METASTATIC CALCIFICATION

The cases of metastatic calcification in children (Jadassohn; Thomas; Lightwood) have not been included either in the tables or in the analysis just given, since, as has been stated before, this condition differs materially from the type of calcinosis with which we are concerned. For the sake of completeness, it will be necessary to mention these cases briefly at this point.

Jadassohn in 1910 reported the occurrence of whitish plaques and white reticular streaks in the skin of a 14 year old boy followed by the development of abscesses and of osteomyelitis of the pelvic bones. Roentgen examination revealed: rarefaction of the pelvic bones, a zone of calcareous deposition in the thigh at the level of the knee and calcific deposits in the shoulders, elbows and thighs. Death occurred three months after the patient was examined. Necropsy revealed osteomyelitis of the right ilium and several of the ribs; aortic verrucous endocarditis; multiple abscesses in the lungs, the myocardium and the left kidney; osteitis rareficans; osteomalacia of the long bones and the pelvis, and deposits of calcium in the muscles, the kidneys, the lungs and the elastica of the splenic arteries.

Thomas in 1926, in a discussion of Weidman and Shaffer's paper, described the occurrence of metastatic calcification in a boy (the exact age was not given) who had died in uremic coma. At necropsy, examination revealed: marked calcification of the small arteries; a large calcareous plaque in the skin of the right buttock; rarefaction of the long bones, and hypertrophy of both parathyroid glands, which measured 2 cm. in diameter.

Lightwood in 1932 described a case under the title "Dwarfism and Calcinosis Associated with Widespread Arterial Degeneration" in a 2 year old girl. The child must have had renal rickets with arterial disease (dwarfism; systolic blood pressure, 180 mm.; results of urinary examination characteristic of chronic nephritis). The abnormal calcification of tissue in this case would be an end-result similar to that described

in cases of metastatic calcification, for necropsy revealed the presence of calcification in the kidneys, the lungs, the dura mater, the endocardium and the peritoneum. Obliterative endarteritis was present.

CONCLUSIONS AND SUMMARY

Calcinosis, or the abnormal deposition of calcium salts in the body, may occur alone or in association with other conditions. Scleroderma, dermatomyositis and myositis ossificans frequently precede or occur in conjunction with the calcinosis.

In our opinion, calcinosis represents another stage in the development of the underlying pathologic process, which may have first manifested itself as scleroderma, dermatomyositis, myositis fibrosa or myositis ossificans. Certainly the latter conditions and calcinosis are closely related.

The pathogenesis of calcinosis is obscure. What factor determines why and when the calcification shall occur and in what sites cannot be stated. It can only be suggested that the calcification is preceded by, and its sites of predilection are determined by, a local change in the tissue, possibly the result of one or more of the following factors: a local injury to the tissue secondary to trauma or infection, an interference in the local vascular supply or a disturbance in the local metabolism or the local acid-base equilibrium.

The customary division of calcinosis into two types (calcinosis circumscripta and calcinosis universalis) seems to be an artificial and unnecessary separation of what may be merely two different stages in the extent of development of the process of calcification. Reference has been made to borderline forms, difficult of classification, which might be grouped differently by different observers. To avoid confusion, it has been suggested that until more is known of the etiology and pathogenesis of this aberrant calcification all forms might be grouped under the general name of calcinosis rather than be subdivided according to location, or to the tissues involved, as has been done hitherto.

Three cases of calcinosis universalis occurring in children are reported, with the observations made at necropsy in the 1 case with a fatal outcome.

Abstracts of reports in the literature of 36 cases of calcinosis (calcinosis universalis and calcinosis circumscripta) occurring in infants and children up to the age of 15 years are appended. An analysis of the data on these cases and on the 3 cases reported in this article are presented.

Metastatic calcification in children was briefly discussed.

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News and Comment

GENERAL

Physicians Certified by American Board of Pediatrics.—The following have been certified by the American Board of Pediatrics since the last report:

John A. Bigler, Highland Park, Ill.; Arthur Proctor Black, Peiping, China; Frederick B. Burke, Detroit; Garabed A. Z. Garabedian, Tulsa, Okla.; Flora K. Rubinstein, Brooklyn; Harry Apfel, Brooklyn; Samuel Sheppard Brown, Brooklyn; John B. Burns, Binghamton, N. Y.; John Walker Canaday, Glens Falls, N. Y.; Fred T. Cavanaugh, Troy, N. Y.; John Frank Coppolino, Philadelphia; Louis Klein Diamond, Boston; Katherine Jean Edgar, Rochester, N. Y.; H. Louis George Jr., Watertown, N. Y.; George Courtenay Glass Jr., Hartford, Conn.; Edward Scott Goodwin, Albany, N. Y.; Milton J. H. Grand, New York; John Bolter Griggs, Hartford, Conn.; Irving LeBell, New York; Walter Levy, New York; Charles H. O'Regan, New York; William Panitch, Newark, N. J.; Henry Nickerson Pratt, Boston; Hugh Currie Thompson Jr., Albany, N. Y.; Henry Woodruff Titus, New Rochelle, N. Y.; J. Alfred Trackman, New York; Mark J. Wallfield, Brooklyn; Henry Washeim Jr., Utica, N. Y.

Twenty-three of these were examined.

American Board of Pediatrics.—After Sept. 30, 1936, the certification fee will be $30.

UNIVERSITY NEWS

Dr. Langley Porter, who recently retired as dean of the Medical School of the University of California, has accepted the directorship of the department of medical history of that university.

SOCIETY NEWS

Fourth International Congress of Pediatrics.—The Fourth International Congress of Pediatrics will meet in Rome in April 1937.

PERSONAL

Dr. Samuel Z. Levine has been promoted to the rank of professor of pediatrics and head of the department of pediatrics of the Cornell University Medical College.

DEATHS

Dr. Eric Peiper, professor emeritus of pediatrics in Greifswald, died recently at the age of 80 years. Dr. Peiper was well known both as a teacher and as an investigator.

Abstracts from Current Literature

Anatomy and Physiology

PENETRATION OF MOIST HEAT APPLIED TO THE ABDOMEN AND ITS EFFECT ON INTESTINAL MOVEMENTS. HJALMAR E. CARLSON and THOMAS G. ORR, Arch. Surg. **30**:1036 (June) 1935.

Determinations were made on dogs, a child and on adults to see whether the application of moist heat to the abdomen would have any effect on the temperature of the intestines and on intestinal contractions.

It was determined that local applications of heat to the abdomen produce a rise in temperature within the abdomen if the abdominal wall is not too thick. Definite penetration was noted in the child and in the dogs, but the penetration in the adults was negligible. Prolonged application of heat did not increase the degree of penetration. Intestinal tone or intestinal movements were not affected by the application of heat to the abdomen. KAISER, Rochester, N. Y.

ANOMALOUS RELATIONSHIP OF THE RIGHT URETER TO THE VENA CAVA. A. RANDALL and E. W. CAMPBELL, J. Urol. **34**:565, 1935.

We have reported two cases of obstructive nephropathy with pyonephrosis caused by the passage of a ureter completely around the vena cava in its descent to the bony pelvis. The literature contains reports on three patients who came to autopsy and on one on whom an operation was performed. To the latter group we now add our two observations.

FROM THE AUTHORS' SUMMARY. [ARCH. PATH.]

FUNCTIONS OF THE THYMUS. P. LEREBOULLET and J. ODINET, Paris méd. **1**:537 (June 8) 1935.

The authors report experimental work with thymectomized animals in which there was definite retardation of growth and development. Conversely, growth and development were accelerated in animals treated with extract of thymus glands. Clinical observations are also cited which support the theory that the thymus is a gland of internal secretion. LESLIE, Evanston, Ill.

MECHANISM OF DECALCIFICATION OF BONE. M. COPPO, Paris méd. **2**:110 (Aug. 10) 1935.

Although Coppo gives great credit to Policard and Leriche for their work on the physiology of bone, he does not agree that increase in circulation is the cause of bone resorption. In the ten years that he has studied the question he has found that loss of minerals invariably follows section of nerves, but does not occur with hyperemia from other causes. LESLIE, Evanston, Ill.

Biochemistry, Bacteriology and Pathology

THE RÔLE OF SERUM-CALCIUM FRACTIONS IN THE EFFECT OF VIOSTEROL ON THE BLEEDING TENDENCY IN JAUNDICE. J. S. GRAY and A. C. IVY, Am. J. Digest. Dis. & Nutrition **2**:368 (Aug.) 1935.

Fifty-six patients with jaundice at the Cook County Hospital were the subjects of this investigation. Viosterol with a vitamin D potency of 250 units (U. S. P. X [Revised, 1934] was administered in doses of 30 drops three times a day. This uniformly reduced the "venostasis-bleeding time" to within normal limits (two hundred and forty seconds). The effect of viosterol on the total

calcium content of the serum was limited to prevention of the slight decrease that would have occurred had the patients received no viosterol, as evidenced by the fall in the total serum calcium content for the control group. Calcium should be given in addition to viosterol in cases of jaundice.

MORRISON, Savannah, Ga.

EFFECTS OF PREGNANCY URINE ADMINISTRATION TO FEMALE SWINE. E. P. TSCHERNOZATONSKAJA, Endocrinology **19**:413 (July-Aug.) 1935.

This paper comes from the State Institute of Meat Industry, Moscow, Russia.

Forty swine, all females, aged from 4 to 5 months, were divided into two equal groups. One group served as controls. To the other group were administered ten subcutaneous injections of the urine of pregnancy at intervals of two or three days. The total amount injected ranged from 175 to 200 cc., corresponding to from 875 to 1,000 mouse units of prolan.

After the first two or three injections the treated animals gained weight more rapidly than did the controls. They were excited and lively and showed a greater relish for food. Later they became depressed and apathetic, ate less than the controls and lost weight. Of the twenty experimental animals, only two showed sexual excitement, whereas all the control animals showed typical manifestations of rut.

After the injections were stopped the experimental animals showed a quick recovery, and by the end of the second month they weighed considerably more than the controls.

Degenerative changes were noted in the ovaries of the treated animals, these organs being about twice the size of those of the controls.

JACOBSEN, Buffalo.

THE RELATION OF DIET AND SERUM-CALCIUM TO TETANY IN THE PARATHYROIDECTOMIZED RAT. M. M. HOSKINS, Endocrinology **19**:453 (July-Aug.) 1935.

While dogs and cats almost invariably die of tetania parathyreopriva when parathyroidectomized unless therapeutic means are used to preserve them, some rats may survive for weeks or months after they have been deprived of their parathyroids. This fact makes the rat an excellent animal for the study of the underlying cause of the tetany syndrome.

Hoskins considers the explanation that accessory parathyroids are present in surviving animals invalid, as these may be found in only 5 per cent of animals, whereas in some series 50 per cent have lived following parathyroidectomy. Another possible explanation is that the calcium and phosphorus of the diet are the determining factors in the development or nondevelopment of tetanic symptoms.

To test this view, one hundred and sixty rats were placed on seven diets in which the calcium-phosphorus ratio ranged from 0.012 to 1.66. It was found that the higher calcium-phosphorus ratios protected rats from tetany by preventing a considerable drop in the serum calcium content. In animals with the lower ratios tetany developed in some cases, but the mortality was never greater than 30 per cent.

In groups with low serum calcium values tetany could not be correlated closely with the blood calcium level and appeared to depend on some endogenous factor. The conclusion is that while a low serum calcium content is a necessary part of the tetany syndrome, the development of symptoms depends also on other endogenous factors the nature of which is not known.

JACOBSEN, Buffalo.

Metabolism; Infant Feeding; Milk and Other Foods

PASSAGE OF NATIVE PROTEINS THROUGH THE NORMAL GASTRO-INTESTINAL WALL. BRET RATNER, Am. J. Digest. Dis. & Nutrition **2**:324 (July) 1935.

The defense mechanisms which tend to impede the entrance of proteins in an unchanged state into the blood stream and tissues are: (1) the impermeability of

the intestinal mucosa, (2) the digestive enzymes, (3) specific antibodies and (4) the excretory functions of the kidney. Denaturation of protein by heat and other culinary processes also aid the body in this defense.

When antigens enter in small amounts and at frequent intervals, an immunity is established. If antigens enter in particularly large amounts and at infrequent intervals, the animal or man may become profoundly sensitized, and the subsequent ingestion of even small amounts of antigen is likely to produce allergic manifestations, shock or even death.

MORRISON, Savannah, Ga.

THE USE OF BANANA SUGAR AS THE CARBOHYDRATE IN MILK MIXTURES FOR WELL BABIES. N. O. PEARCE, Arch. Pediat. **52**:292 (May) 1935.

Results are described in the cases of two hundred infants fed milk mixtures containing banana sugar in lieu of the usual carbohydrates. This group of infants was studied from the standpoint of nutrition, gastro-intestinal symptoms and hemoglobin determinations. The theoretical advantages of banana sugar are discussed. Pearce believes this carbohydrate to be a safe and satisfactory sugar for use in infant feeding.

WADDELL JR., University, Va.

FEEDING IN ADOLESCENCE. MARY E. ORMSBY, Brit. J. Phys. Med. **10**:32 (June) 1935.

The author presents a method for the instruction of mothers in the preparation of meals. She deplores the exploitation of vitamins because of the danger of hypervitaminosis and because vitamin-containing roughage when given in large amounts causes gastro-intestinal irritation and upset. A list of what to avoid and what to substitute in convalescent diets for adolescent patients is given.

HARTMAN, Cleveland.

NUTRITIONAL DISEASES: ANNUAL REVIEW, 1935. F. RATHERY and M. RUDOLF, Paris méd. **2**:1 (July 6) 1935.

This article is a summary of the understanding to date of the parts played by calcium and phosphorus in the normal physiologic state and in various nutritional disturbances. The material is well presented, and numerous references are given.

LESLIE, Evanston, Ill.

CONTRIBUTION TO THE STUDY OF GLOBULES OF FAT IN MATERNAL AND COW'S MILK. G. RESTIVO, Pediatria **43**:544 (May) 1935.

The author based his conclusions on a detailed study of twenty-eight samples of whole cow milk, twenty-two samples of whole human milk, thirteen samples of skimmed cow milk and five samples of skimmed human milk. He submits the following comparative findings:

1. The total number of globules of fat in human milk and cow milk varies within the same limits from 1,000,000 to 5,000,000 with an average of about 3,000,000.

2. The size of the globules varies in the two milks from 1 to 20 microns in diameter. Globules measuring from 1 to 5 microns are classified as small; those measuring from 5 to 10 microns are classified as medium, and those measuring more than 10 microns are classified as large.

3. Of the various globules in cow milk, 79.9 per cent are small; 20.51 per cent are medium, and 0.40 are large, representing an average fat content of 3.57 per cent.

4. Of the various globules in human milk, 75.47 per cent are small; 20.60 per cent are medium, and 1.93 per cent are large, representing an average fat content of 4.96 per cent.

5. Skimming causes loss of most of the large globules (99 per cent), loss of 93.5 per cent of the medium globules and loss of 32 per cent of the small globules.

It appears from these observations that dyspepsia in breast-fed infants cannot be attributed to an excess of fat but rather to other causes, such as an excessive carbohydrate content or a deficient protein content or to some particular intolerance of the infant to the maternal milk.

SIGNORELLI, New Orleans.

HORMONE THERAPY IN INFANTILE ATROPHY. P. ROBOZ, Jahrb. f. Kinderh. **44**: 240 (April) 1935.

Twenty atrophic infants were treated with intramuscular injections of a watery solution of thymus gland extract (from 0.5 to 1 Gm. of thymus per kilogram of body weight). Six of the patients were cured, and eight showed improvement.

The improvement under this therapy is attributed to two factors. The first, the improvement of the appetite, is often evident before the increase of weight is noted. The second factor in causing the improvement is thought to be the increased water-holding ability of the tissues.

LANDAU, Rochester, N. Y.

HORMONAL REGULATION OF BLOOD SUGAR IN INFANCY. H. SCHONFELD, Monatschr. f. Kinderh. **61**:241, 1935.

In the nursling, after a short period of hunger hypoglycemia develops, which resembles in some respects that following underfunction of the anterior lobe of the hypophysis. With the use of a preparation of the anterior lobe of the pituitary the author was unable to overcome the hypoglycemia. On the other hand, a solution of an extract of the posterior lobe of the pituitary abolished the symptom in all cases.

GERSTLEY, Chicago.

NUTRITIONAL DISTURBANCE. G. BESSAU, Monatschr. f. Kinderh. **63**:3, 1935.

Bessau in a rather surprising manner reopens the whole subject of infant nutrition. In a thirty page article he reviews the entire field and reminds the reader that the subject of infant nutrition is by no means closed, in spite of the fact that many novices think that there is nothing more to be learned. In broad generalities he discusses the contributions of Czerny and Finkelstein. He leans toward the classification of Czerny, but his general principles are unquestionably those of the Finkelstein school. However, he does not like the term *Ernährungsstörung* (disturbance of nutrition), because he feels it is too comprehensive. Practically every abnormal state known is accompanied by some change in nutrition.

He suggests some new terms which may or may not come to be generally used. The term *Ernährungsstörung* is to be replaced by "dysontia". Dysontia may be of two types, dystrophy and dysergy. Dystrophy is characterized by anatomic or pathologic recognizable change. In dysergy changes of body composition exist the degree of which cannot be estimated. The two conditions are by no means parallel. The illustration is given of Finkelstein's "masked decomposition," in which state the child may not appear very sick but reacts in an exaggerated form to nutritional injury.

The dysergic disturbances of function can be divided into three elementary forms: a tendency toward infection, a tendency toward diarrhea and a tendency toward edema. All these are discussed in considerable detail.

Bessau places considerable importance on the presence and activity of the bifidus flora. Diarrhea in breast-fed infants is of no significance. Diarrhea in artificially fed infants assumes importance in the presence of a mixed flora. In the presence of the bifidus flora lactose may be used in any amount without injury.

The author also quotes some interesting experiments which suggest that the bifidus organisms in the alimentary tract may produce vitamin B.

GERSTLEY, Chicago.

FREQUENT FAILURES IN INFANT FEEDING DUE TO MISUNDERSTANDING. E. MORO, München. med. Wchnschr. **82**:949 (June 14) 1935.

Moro presents the clinical pictures of a large number of disturbances of feeding which occur in infants. These include conditions in breast-fed as well as in artificially fed infants. He then states in each case what mistakes the practicing physician frequently makes in determining the reason for the disturbance and the treatment prescribed. The unfortunate outcome of the result of the mistakes in diagnosis and treatment is tersely stated at the end of the paragraph. Then follows a paragraph with the correct interpretation of the symptoms and the proper treatment in each case. The article is an instructive analysis of the many difficulties which may be encountered in infant feeding but does not lend itself to condensing or abstracting.

BRAHDY, Mount Vernon, N. Y.

Vitamins; Avitaminoses

IS THE PUBLIC BEING STAMPEDED IN REGARD TO VITAMINS? WALTER C. ALVAREZ, Am. J. Digest. Dis. & Nutrition **2**:128 (April) 1935.

This is an excellent article which shows how grossly the American public falls for concerted advertisement. The truth about an advertised product is often disregarded or misrepresented by mnaufacturers in order to make the product popular. More articles of this nature are needed in order to enlighten the vitamin-minded American people.

MORRISON, Savannah, Ga.

CAROTENE IN PROPHYLACTIC PEDIATRICS. ARTHUR S. SANDLER, Arch. Pediat. **52**: 391 (June) 1935.

A group of fifty-three children who lived under identical conditions in an orphanage and whose medical history was well known since entrance to this home were selected for study. On the basis of their past history, twenty-seven children with known high resistance to infections of the upper respiratory tract and all other types of infections were selected as controls. The other twenty-six children, who had a history of repeated infections and low resistance, poor appetite and poor gains in weight and in height, were fed carotene in oil as a routine with their meals from Aug. 1, 1933, until May 1, 1934. The gains in weight and in height, the condition of the blood and the frequency and severity of infections of the upper respiratory tract were closely watched throughout the period of the test. The general impression gained by Sandler from this study is that carotene in oil is of distinct value in the majority of infants and children in that it has a noticeably beneficial effect on general nutrition and growth, it definitely increases resistance to the upper respiratory tract infections and perhaps to infections in general, and it influences favorably the hemoglobin content, particularly at a time of year when the trend is a diminution of the amount of hemoglobin.

The part played by vitamin A in the body economy is discussed briefly. Carotene, the precursor of vitamin A, is described, together with its sources in nature. Sandler believes that so-called carotenemia should be considered as nothing more than an indication that the body has all of this important food element that it needs at a particular time and that carotenemia is not a disease nor is it dangerous.

WADDELL JR., University, Va.

OBSERVATIONS ON THE ABSORPTION OF CAROTENE AND VITAMIN A. J. C. DRUMMOND, MURIEL E. BELL and ELIZABETH PALMER, Brit. M. J. **1**:1208 (June 15) 1935.

A study was made on a patient with chylothorax, the case being reported by Muriel E. Bell on page 1201 of the same journal. Carotene and vitamin A were administered, and a study was made of both these substances in the chylous contents. The author's summary is as follows:

"1. A study has been made of the absorption of vitamin A and carotene administered to a patient suffering from a condition which led to part of the

contents of the thoracic duct being diverted into the pleural cavities. Analysis of the fluid removed at intervals from the chest cavities enabled approximate estimations to be made of the amount of vitamin A and carotene absorbed by way of the chyle.

"2. It was found that a relatively small proportion of the carotene administered orally could be accounted for by the pigment found in the chylous fluid, whereas in the case of vitamin A the amount recovered was such as to indicate an almost complete absorption.

"3. The vitamin administered as the free alcohol was found present in the lymph mainly in the esterified condition, and it is thought probable that the linkage with the fatty acids during passage through the intestinal walls accounts for the much higher coefficient of absorption as compared with that found when carotene was given.

"4. Observations on the chylous fluid show that over a range of reaction much wider than that encountered in body fluids no trace either of carotene or of vitamin A passed a dialysing membrane. Both compounds appeared to be present in colloidal form and closely associated with the highly dispersed fat."

ROYSTER, University, Va.

PROPHYLAXIS OF RICKETS. E. FREUDENBERG, Bull. Assoc. internat. de pédiat. prevent. **2**:12, 1935.

The author believes that the best prophylactic treatment of rickets in babies is assured by thorough and prolonged medical supervision, and he recommends particularly accustoming to the open air not only of full-term infants but also of premature babies. By these general measures, medical and hygienic, it is possible to prevent at least the graver manifestations of rickets. In many cases special measures must also be adopted. For practical reasons, the ultraviolet rays cannot be used for mass treatment; and for financial reasons, the administration of irradiated milk, either fresh or dry, has, to all intents and purposes, been given up, a fact which the author regrets since he believes irradiated milk to be the best preventive of rickets. The least costly agent of prophylaxis is viosterol, which he gives in the following fashion: He begins with 4 clinical units per diem during the first three months, and goes on progressively to 6 or 8 clinical units per diem during the second and third quarters. To assure the best results from this treatment, the infant must pass the longest time possible in the open air; care must also be taken to let it have not more than a half liter of milk daily, and to provide it with a varied diet, in great part vegetable.

Finally, the author draws attention to the possibility of "prenatal prophylaxy" —that is to say, the application of ultraviolet rays to the expectant mother and assuring to her a rationally balanced diet.

AMESSE, Denver.

INFLUENCE OF VITAMIN A ON THE METABOLISM OF THE RAT AND THE GUINEA-PIG. ANDRÉ CHEVALLIER and HENRY BAERT, Compt. rend. Soc. de biol. **116**:1037 (June 12) 1934.

Vitamins B and C have been shown to lower the basal metabolic rate. Chevallier and Baert subjected white rats and guinea-pigs to metabolic measurements by the d'Arsonval method.

It was found that the animals fed a diet devoid of vitamin A, especially the younger animals, showed a definite increase in the metabolic rate, while those fed excessive doses of vitamin A showed a marked diminution in the basal metabolism, as compared with the controls.

WAHL, Cleveland.

KERATOMALACIA IN A BREAST-FED INFANT. ALEXANDER KOTIKAS, Monatschr. f. Kinderh. **63**:108, 1935.

A breast-fed infant aged 9 months began showing loss of appetite, loss of weight with diarrhea, and eventual malnutrition from the sixth month. The diagnosis was in doubt for a considerable time until the development of keratomalacia suggested a deficiency of vitamin A. It was then found that the mother, through extreme poverty, had taken a diet exclusively of bread, raw onions and an occasional vegetable. She received practically no lipoids. In addition, a complicating pregnancy probably increased her own demands for whatever of this vitamin was present in her own body.

GERSTLEY, Chicago.

DOES THE BIFIDUS FLORA PRODUCE VITAMINS? ERNST REICHELT, Monatschr. f. Kinderh. **63**:138, 1935.

Using pigeons on a beriberi-producing diet as controls, Reichelt found that 7 Gm. of a stool of a breast-fed infant could cure the condition. He then experimented with cultures of bifidus flora and found that they, too, had healing properties. He therefore suggests tentatively that the bifidus flora has the property of manufacturing vitamin B.

GERSTLEY, Chicago.

ROENTGENOGRAMS FOR RACHITIC CHILDREN WITH AND WITHOUT TETANY. E. E. JOEPCHEN, Monatschr. f. Kinderh. **63**:217, 1935.

Some observers have attempted to explain the occurrence of tetany in rachitic children by presuming that it developed during the healing stages of rickets, in other words, following a sudden shift of the blood calcium and phosphorus contents. If this were so, roentgenograms taken of children suffering from rickets would vary considerably, depending on the presence or absence of tetany. In a large series Joepchen found no difference between a group of rachitic children with tetany and a group of rachitic children without tetany. There is no evidence, then, in the roentgenograms to suggest that the development of tetany occurs simultaneously with beginning healing of rickets.

GERSTLEY, Chicago.

DARÁNYI'S REACTION IN INFANTILE BERIBERI AND OTHER DISEASES OF CHILDREN. Y. KITAMURA, J. Pediat. (Tokyo), no. 421, June 20, 1935, p. 771.

In infantile beriberi, bronchitis, exudative diathesis and rickets the Darányi colloid lability reaction was either weakly positive or entirely negative, while in pulmonary tuberculosis and congenital syphilis it was strongly positive.

KATO, Chicago.

THREE CASES OF RICKETS REFRACTORY TO TREATMENT. T. HALBERTSMA, Maandschr. v. kindergeneesk. **4**:267 (April) 1935.

Refractory rickets shows three different types: (1) temporary nonhealing of the rickets caused by infections; (2) persistent rickets because the doses of vitamin D are too small; (3) total refractory rickets persisting in spite of any therapy, even in very large doses, and accompanied now and then by a disturbance of the metabolism. The author describes two children, 14 and 16 months old, with rickets belonging to the first type; a child of 5 years with rickets of the second group and a boy of 7 years whose condition was refractory to any therapy.

VAN CREVELD, Amsterdam, Netherlands.

PROGRESS OF THE KNOWLEDGE OF VITAMINS DURING THE LAST FOUR YEARS. G. GRIJNS, Nederl. tijdschr. v. geneesk. **79**:1401 (March 30) 1935.

A survey of the progress of the knowledge of the chemical constitution of the vitamins, with their formulas and properties, is given.

VAN CREVELD, Amsterdam, Netherlands.

VITAMIN D CONTENT OF COD LIVER OIL. L. W. VAN ESVELD, Nederl. tijdschr. v. geneesk. **79**:2924 (June 15) 1935.

On examination of sixteen samples of cod liver oil the standard of vitamin D appeared to range between 50 and 200 international therapeutic units per gram (double estimations). Among eleven samples, sent to the National Institute for Public Health of The Netherlands for control, only one contained less than 100 units. In three samples of cod liver oil sold unpacked in bottles but not standardized, the vitamin content ranged between 50 and 80 units; the unpacked oil was evidently inferior in quality. It is claimed that for medical cod liver oil a minimum of 100 international units vitamin D should become an official requirement.

VAN CREVELD, Amsterdam, Netherlands.

Hygiene; Growth and Nutrition; Public Health

A RESEARCH STUDY OF DIAPER SIZES AND FOLDING METHODS. RUTH HOWARD SAYERS, Arch. Pediat. **52**:201 (March) 1935.

The author attempts to determine what particular size of diaper would seem to be most satisfactory and comes to the conclusion that a diaper 19 by 40 inches (48.3 by 101.6 cm.) seems to meet all requirements. In addition, she discusses the methods of folding diapers in general use and describes a method which she believes to be superior to any other.

WADDELL JR., University, Va.

THE IMPORTANCE OF MEDICAL SUPERVISION DURING EARLY INFANCY ON THE INFANT DEATH RATE. HARRY BAKWIN and RUTH MORRIS BAKWIN, New York State J. Med. **35**:313 (April 1) 1935.

A study of the weight, height and general growth was made on three groups of infants. The first group of 534 infants were admitted as "healthy boarders" to the Bellevue Hospital but had had no regular medical supervision; the second group of 352 babies were born at the Bellevue hospital and were well supervised in the clinic, and the last group of 514 infants were born at the Fifth Avenue Hospital and were cared for in the special clinic. Naturally, better gains were made in the groups in which there was supervision. The delay in the growth of the infants who received no supervision occurred in the first twelve weeks, and growth thereafter continued at a normal rate, but at a lower level. The morbidity and mortality rates were higher in underdeveloped children.

AIKMAN, Rochester, N. Y.

OCCUPATIONAL THERAPY AS PRACTICED IN CHILDREN'S HOSPITALS FOR SURGICAL TUBERCULOSIS. HENRY GAUVAIN, Brit. J. Phys. Med. **9**:179 (Feb.) 1935.

The purposes and results of organized occupational therapy in hospitals for children with chronic illnesses are discussed. The training is designed with several objects in view: to engage the patient's mind for the time being, to offer educational advantages and to provide training that will be of benefit in the future along both avocational and vocational lines. In the institution described in the article, from fifteen to twenty instructors are provided. Several interesting histories showing results of the work are presented.

HARTMAN, Cleveland.

THE PHYSICAL CONDITION OF CHILDREN IN CARDIFF AND RHONDDA SCHOOLS. A. G. WATKINS, Brit. M. J. **1**:1256 (June 22) 1935.

The title of the article describes the study in brief. The article does not lend itself to abstracting.

ROYSTER, University, Va.

HEIGHT-WEIGHT-AGE STANDARDS AS AN INDEX OF NUTRITION OF CHILDREN: A PRELIMINARY REPORT. I. FREED, South African M. J. **9**:467 (July 13) 1935.

Freed found that the figures for the height and weight of 300 improperly fed and badly housed children of Velddrift so closely approximated the standard figures

of English and American charts that he is forced to conclude that "height and weight tables are at once blind and futile, and that any deductions which are made regarding the nutrition of children from these tables are distorted, unwarranted and unjustified." In a subsequent report it is intended to determine how much nearer the ACH index (girth of arms, depth of chest and width of hips) will approach the true clinical picture in this group of cases. GONCE, Madison, Wis.

THE ACH INDEX AS APPLIED TO SOUTH AFRICAN BOYS. C. L. LEIPOLDT, South African M. J. **9**:471 (July 13) 1935.

Leipoldt reports the results of application of the ACH index (girth of arms, depth of chest and width of hips) to 1,115 South African boys ranging in age from 7 to 12 years. The index was found to give a percentage of undernourished children closely corresponding to that obtained by clinical methods. It is thought, however, that the key table needs revision for South African children, especially the colored children.

GONCE, Madison, Wis.

MUNICIPAL ORGANIZATIONS FOR THE PROTECTION OF INFANTS AND CHILDREN AT LYONS, FRANCE. P. VIGNE and CHARLES GARDÉRE, J. de méd. de Paris **55**:91 (Jan. 31) 1935.

In order to encourage breast feeding of the young infant, two organizations function. The first provides three meals a day for pregnant mothers after the fifth month of pregnancy and for all mothers nursing their infants who bring the child for examination twice a month. The second, carrying out the Strauss law, provides 7 francs and 50 centimes a day for the twenty-eight days preceding and following delivery, respectively, 45 francs a month for the first six months to the mother who nurses her infant and 15 francs a month thereafter during the remainder of the first year. Day nurseries care for artificially fed babies and provide necessary food and medical supervision. There are also two institutions which assume complete care of children between the ages of 8 months and 3 years. In addition, an organization for placing children in families and supervising the care of children so placed has functioned satisfactorily since 1923.

LESLIE, Evanston, Ill.

INTEGRAL PROTECTION OF THE CHILD. GREGORIO ARÁOZ ALFARO, Bol. Inst. internac. am. de protec. a la infancia **8**:379 (April) 1935.

The author recalls his written and spoken efforts of many years in congresses and conferences and when he was president of the National (Argentine) Council of Health toward securing in his country the necessary cooperation and coordination between the different associations and institutions, both private and public, for children's and mothers' welfare.

He sets forth the work carried out in Italy by the Opera Nazionale per la Protezione della Maternità e dell' Infanzia, which as one of its activities, has assisted 6,181 children menaced by tuberculosis during the last two years. Special sections for tuberculous mothers have been organized in the maternity homes.

Up to their third year, children are assisted by means of clinics and milk centers. The organization operates 100 mothers' and children's centers and more than 2,500 clinics of local practitioners. A new activity is carried out by means of the summer temporary homes in the provinces with a high infant mortality.

LESLIE, Evanston, Ill.

MEDICOSOCIAL CARE OF THE CHILD IN PERU. LUIS A. SUARES, Bol. Inst. internac. am. de protec. a la infancia **8**:389 (April) 1935.

After discussing the different aspects of the medicosocial care of the Peruvian child, the author mentions the institutions charged with that care: The Board

for the Protection of Children, which was established in 1933, has been replaced by the Committee of Child Protection, with all the attributes of the former and with a technical agency called the National Institute of the Child, which connects the Committee with all public and private organizations of child care. Other institutes have been founded in Trujillo, Cuzo and Arequipa, and it is intended to organize one in each of the provinces.

The author arrives at the following conclusions:

1. That luncheon rooms and refectories should be founded for dependent married and unmarried mothers and pregnant women, where they may get sufficient food during the last month of pregnancy, at least, and during the first three months after confinement.

2. That the project for the construction and functioning of a building with 60 beds for tuberculous children at the Children's Hospital should be carried out immediately.

3. That propaganda for the multiplication of children's seaside colonies, such as the one now active in Ancón, should be intensified.

4. That a sanatorium for curable tuberculous children in Chosica, should be established with a minimum capacity of sixty beds.

5. That the law which establishes a tax of 10 per cent on all public shows in Lima, Callao and on the bathing beaches should be extended to all the country and that the funds thus collected be used not only to broaden the services of the capital relating to child care, but also to organize, on sound economic basis, provincial institutes for child care.

6. That the law which recognizes the statute of the Committee of Child Protection should be made effective, so as to unite in one central organization all the medicosocial child care that is being done in Peru.

7. That a recommendation should be made to the public authorities for the study and betterment of the housing conditions among the working classes as a means of child protection.

LESLIE, Evanston, Ill.

A PROPOSAL FOR THE REFORM OF CHILDREN'S OUTPATIENT DEPARTMENTS. HERMAN ZISCHINSKY, Jahrb. f. Kinderh. **44**:172 (March) 1935.

The danger of the spread of infectious diseases in outpatient departments is stressed. A plan for the arrangement of a building with numerous separate rooms is given. These are arranged so that the patients are not exposed to each other when entering or leaving. A detailed diagram accompanies the description.

LANDAU, Rochester, N. Y.

Prematurity and Congenital Deformities

DIAPHRAGMATIC HERNIA: WITH A REPORT OF TEN CASES OF OESOPHAGEAL ORIFICE HERNIA. KATHERINE S. ANDREWS, Am. J. Digest. Dis. & Nutrition **2**:310 (July) 1935.

The incidence is apparently increasing because of improved roentgenographic methods of demonstrating the presence of this type of hernia.

Hernia through the esophageal orifice does not always present symptoms. When symptoms are present, they are of two types, symptoms referable to the abdomen and those referable to the thorax.

An important symptom is pain or abdominal discomfort, unrelated to food. It may simulate biliary colic or angina pectoris and is often relieved by assuming an upright position. Dysphagia was noted in three and nausea and vomiting in seven of ten cases. Hematemesis was not noted. Of symptoms referable to the thorax, cough is the most prominent and persistent and is often paroxysmal and nonproductive. Palpitation and dyspnea are observed most often in association with cardiac disease.

The diagnosis is always made by roentgenography.

MORRISON, Savannah, Ga.

THE MANAGEMENT OF PREMATURE INFANTS. HARRY LOWENBURG, Arch. Pediat. **52**:313 (May) 1935.

The facts known at present concerning the feeding and handling of premature infants are reviewed.

WADDELL JR., University, Va.

EVENTRATION OF THE DIAPHRAGM: WITH A REPORT OF TWO CASES. JOHN A. REED and DANIEL L. BORDEN, Arch. Surg. **31**:30 (July) 1935.

In a report of two cases of this rare condition the authors prepared an excellent review of the subject, including the theories of origin. The anomaly is assumed to be congenital in most instances. As a large percentage of the reported cases occurred in infants and children, it is a condition that should not be overlooked in children in whom vague respiratory and gastro-intestinal symptoms are present.

Medical management is the treatment of choice. Surgical intervention has not yielded good results. In general, the prognosis for life is good, but the disease is disabling for many persons.

KAISER, Rochester, N. Y.

ANENCEPHALIC MONSTER WITH PRENATAL DIAGNOSIS IN A PREVIOUSLY CESAREANIZED PATIENT. MELVIN BERLIND, M. Rec. **141**:519 (June 5) 1935.

At the age of 30 the patient had been delivered by cesarean section of a healthy child, weighing over 9 pounds (4.1 Kg.). The patient had met with an accident during her childhood and had since walked with a limp. On account of this all the pelvic measurements were small. A year later the patient again became pregnant and at three months showed marked polyhydramnion. Abnormality of the fetus was assumed. A roentgenogram revealed an anencephalic fetus in association with polyhydramnion. Labor was brought on, and 6 quarts (946.4 cc.) of amniotic fluid was obtained. After eleven hours of labor spontaneous delivery was performed with the patient under ether anesthesia. The fetus was an anencephalic monster, approximately of thirty-six weeks' development and was delivered from below.

WILLIAMSON, New Orleans.

CONGENITAL DIAPHRAGMATIC HERNIA IN AN INFANT WITH SUCCESSFUL OPERATION. JOSEPH WEINBERG and HOWARD HAMILTON, Nebraska M. J. **20**:241 (July) 1935.

An infant, 5 months of age, suffering from congenital diaphragmatic hernia, underwent successful operation. The chief complaints at the time the baby entered the hospital were as follows: cyanosis, difficulty in breathing, vomiting and ability to take only a small amount of food at a time. The appearance of the chest and the physical findings varied at different times. The suspected diagnosis was confirmed by roentgenogram.

HAMILTON, Omaha.

TWO CASES OF TRANSPOSITION OF VISCERA IN ONE FAMILY. J. S. MANSON, Brit. M. J. **1**:1171 (June 8) 1935.

A brief report is made of two cases of transposition of the viscera occurring in one family, one in a boy, aged 17 years, and the other in a sister, aged 21 years.

ROYSTER, University, Va.

CLEFT PALATE. W. E. M. WARDILL, Lancet **1**:1435 (June 22) 1935.

The object of operation is to produce a partition between the oral and the nasal cavity and to restore the palate to such a form and condition that it is able to reach the posterior wall of the pharynx and thus to close off its cavity. Without this closure normal speech is virtually impossible, and failure in this respect is responsible for a large proportion of the cases in which poor speech remains after the classic operation. To be successful, then, an operation must aim either to

reduce the size of the nasopharynx or to increase the mobility of the soft tissue in the palate.

Pharyngoplasty and repair of the palate are described as well as the post-operative care of the patient.

The results of the operation as described have proved most satisfactory if operation is performed before habits of defective speech have become firmly established and if the palatal mechanism is restored.

LANGMANN, New York.

DIAPHRAGMATIC HERNIA. R. H. BAILEY, Proc. Roy. Soc. Med. **28**:1191 (July) 1935.

A case of this condition was reported in a baby, aged 3 months. The results of laboratory investigation and the subsequent history are given. Operative intervention was carried out in view of the lack of improvement. The details of operation are stated briefly.

WILLIAMSON, New Orleans.

CONGENITAL HERNIA OF THE LEFT SIDE OF THE DIAPHRAGM. P. COULOUMA, R. GARRAUD and VAN VARSEVELD, Bull. Soc. d'obst. et de gynéc. **24**:404 (June) 1935.

The lesions were observed at necropsy in a full term male fetus, who apparently died at birth. The left leaf of the diaphragm was present. There was no hernial sac. Most of the large intestine, all the small intestine, the left lobe of the liver, the spleen and the pancreas were in the left thoracic cavity. The lesions are illustrated by means of a diagram and two roentgenograms. One of the interesting features was the presence of the appendix in the apex of the left pleural cavity, beneath the clavicle. The hernia is attributed to congenital failure of development of the left leaf of the diaphragm. GLASER, Rochester, N. Y.

MONOZYGOTIC TWINS WITH A SINGLE AMNION. P. BURGER, Nourrisson **23**:160 (May) 1935.

Burger describes a case of this condition and calls attention to the dangers of asphyxia from intertwining and knotting of the two cords.

After the birth of the first twin it is also important to ligature securely the placental end of its cord to prevent dangerous hemorrhage in the second twin from this source.

MCCLELLAND, Cleveland.

New-Born

EXTREME TACHYCARDIA IN THE NEW-BORN, WITH REPORT OF A CASE. LEE E. FARR and MYRON E. WEGMAN, Am. J. M. Sc. **190**:22 (July) 1935.

A case of extreme tachycardia in a 24 day old infant is noted. The pulse rate, which was too rapid to count accurately, was estimated at 300 beats a minute. The etiology was unknown, and the course of the disorder was not obviously influenced by treatment. After the infant reached the age of about 8½ months, having had intermittent attacks, the tachycardia righted itself. Roentgenograms and electrocardiographs are included.

HENSKE, Omaha.

ERYTHROBLASTOSIS NEONATORUM; REPORT OF NINE CASES. JOHN A. MONFORT and GEORGE J. BRANCATO, Arch. Pediat. **52**:431 (July) 1935.

The article is based on a study of nine cases of erythroblastosis foetalis; these are reported in detail. Various theories as to the etiology are discussed, and the clinical features of the disease are reviewed. Transfusions were the only therapeutic measures which seemed to be of benefit.

WADDELL JR., University, Va.

BULLOUS IMPETIGO OF THE NEW-BORN. D. TRUETT GANDY, Arch. Pediat. **52**:483 (July) 1935.

The etiology of bullous impetigo of the new-born is discussed. It would appear as a well established fact that a staphylococcus is the infecting agent and that different strains may differ markedly in their virulence. The potential serious nature of impetigo of the new-born is emphasized. Gandy thinks that bullous impetigo, pemphigus neonatorum and dermatitis exfoliativa neonatorum are clinical variants of the same entity. The clinical symptoms and course of the disease are described, and two small epidemics are reported.

The use of daily rubs with ammoniated mercury ointment according to the method of Chadwell is discouraged because of unfavorable reactions. A well known commercial oil proved effectual in checking this annoying and serious nursery disease.

WADDELL JR., University, Va.

GASTROMEGALY FROM ARTERIO-MESENTERIC COMPRESSION OF THE DUODENUM IN THE NEW-BORN. R. MILLER and H. C. GAGE, Arch. Dis. Childhood **10**:179 (June) 1935.

Three cases of new-born infants with chronic duodenal ileus resulting from arteriomesenteric compression are reported. The chief clinical features of the syndrome consist of the enlarged stomach (gastromegaly), which causes protrusion of the upper part of the abdomen and shows occasional visible peristalsis, and vomiting of the obstructive type. Roentgenographic examination will demonstrate the presence of obstruction in mild cases, and will distinguish between complete and incomplete obstruction in the severe cases. The opaque meal should be given directly after gastric lavage, and should be considerably larger than the normal meal for the patient's age, to allow for the enlargement of the stomach. Medical treatment, chiefly by means of gastric lavage, is capable of restoring the tone of the distended stomach, so that satisfactory progress is possible in spite of the persistence of some degree of duodenal obstruction. It is urged that in cases in which the symptoms suggesting duodenal stenosis or atresia are found to arise from incomplete duodenal obstruction, the possibility of duodenal ileus should be considered and a brief trial of medical measures made before submitting the infant to the extreme risk of an abdominal operation. In the exceptional cases, described by other authors, in which gross megaduodenum was present, operation is probably essential; but in the type described here there is no indication for the performance of duodenojejunostomy.

KELLY, Milwaukee.

CUTANEOUS GANGRENE OF THE NEW-BORN. G. LÉVY, Bull. Soc. d'obst. et de gynéc. **24**:345 (May) 1935.

A secundipara was normally delivered by a midwife. The infant weighed 3,300 Gm. at birth. While it was being cleaned a bluish plaque about the size of a lentil was noticed on one buttock. The author was consulted and diagnosed the lesion as an area of gangrene. The area, which was not surrounded by a definite inflammatory zone, increased somewhat in size during the next twenty-four hours and began to slough. Healing took place in about three weeks. Infection, including syphilis, did not appear to be the cause, which remained unknown. Lévy expresses the belief that the trauma of a fall on the abdomen which the mother experienced late in pregnancy might have been a factor. This etiology has been suggested in previous reports of similar conditions.

GLASER, Rochester, N. Y.

PEDUNCULATED TUMOR OF THE CHIN OF A NEW-BORN INFANT. D. BRUN, Bull. Soc. d'obst. et de gynéc. **24**:402 (June) 1935.

A new-born girl, who weighed 3,100 Gm. at birth, had a pedunculated tumor about the size of an orange attached to the chin. This had interfered somewhat

with flexion of the head during delivery after a vertex presentation. Three small tumors projected from the surface of the main tumor mass; the growth is well illustrated by a photograph of the infant. At the age of 7 days the tumor was easily removed surgically after ligation of the pedicle to secure hemostasis. Grossly, the tumor was a firm, encapsulated, bruised spherical mass. Histologically, it was a benign fibrochondroma. There was no recurrence after two years. The author attributes the tumor to the development of an embryonal midline inclusion of chondrogenic tissue derived from a branchial arc.

GLASER, Rochester, N. Y.

DISSEMINATED ALVEOLITIS DUE TO ASPIRATION OF SEPTIC FLUID. RIBADEAU-DUMAS, MAUGER and LEMOIGNE, Bull. Soc. de pédiat. de Paris **32**:55 (Jan.) 1934.

A boy born before the arrival of an accoucheur remained attached to the cord and lying in amniotic fluid and blood for about an hour. He presented symptoms and signs of respiratory disturbance which were more or less evident until he died at the age of 6 weeks. He took his feedings poorly and failed to thrive. At 3 weeks a roentgenogram of the chest showed numerous tiny areas of density and an increase in hilar shadows. This appearance persisted in another film taken some time later and was suggestive of miliary distribution. The tuberculin reaction was negative. The possibility of the aspiration of septic fluid at birth should be borne in mind to explain respiratory symptoms in new-born infants, who may succumb to acute bronchopneumonia or survive for a longer period and finally die of subacute pulmonary infection.

BENJAMIN, Montreal, Canada.

DERMATITIS EXFOLIATIVA NEONATORUM (RITTER'S DISEASE). DAVEO and BASSARGETTE, Nourrisson **23**:238 (July) 1935.

A small epidemic of six cases, occurring in the maternity section of a hospital in Nice, is described. There were two deaths and four recoveries. The authors believe that bullous impetigo, pemphigus and dermatitis exfoliativa of the new-born are different gradations of the same disease. The only micro-organism that they succeeded in recovering from cultures of the lesions was a staphylococcus.

MCCLELLAND, Cleveland.

Acute Contagious Diseases

STUDIES ON SCARLET FEVER ANATOXIN: SIMULTANEOUS IMMUNIZATION AGAINST SCARLET FEVER AND DIPHTHERIA. K. ANDO and S. NAGATA, J. Immunol. **29**:47 (July) 1935.

Ando and Nagata report a number of experiments on scarlet fever toxoid. Partly purified toxoid was prepared by precipitation with alcohol. The observations of Veldee that the skin of the ear of rabbits could be used for testing antigenicity were confirmed. The authors were able to prepare an equally potent toxoid from toxin resulting from growth in a semisynthetic medium. The addition of alum to toxoid enhanced its antigenicity.

The authors showed also that the degree of immunity in rabbits immunized by combined injections of diphtheria toxoid and scarlet fever toxoid was as high as that following the use of one toxoid alone.

FOTHERGILL, Boston.

SUMMARY OF CURRENT PREVALENCE OF COMMUNICABLE DISEASES. Pub. Health Rep. **50**:1165 (Aug. 30) 1935.

For the perod of July to Aug. 10, 1935, 1,433 cases of poliomyelitis were reported. This was 38 per cent above the number of cases reported during the corresponding period in 1934. The epidemic was confined largely to the Atlantic seaboard; about two thirds of the cases were in North Carolina, Virginia, New York and Massachusetts. The number of cases of meningococcic meningitis also

increased to 2.3 times last year's figure, which is the highest incidence since 1930. The incidence of other contagious diseases continued low. The death rate from all causes was 10 per thousand of population, which is about the same as for other years.

SANFORD, Chicago.

A CRITICAL ANALYSIS OF DIPHTHERIA IMMUNIZATION IN A PROVINCIAL CITY. K. G. KERR, M. J. Australia **1**:775 (June 22) 1935.

There has been a particularly high incidence of diphtheria in the city of Bendigo for many years. On two occasions special efforts were made to immunize children in this city, but in the first attempt it is doubtful whether as many as 25 per cent of the children were immunized, and there was little effect on the general incidence. In the second campaign a larger number were immunized, with consequent greater improvement. However, Kerr believes that in spite of rather intense propaganda it will be difficult to maintain adequate immunization. In support of this he cites the fact that in reply to more than six hundred circulars sent to parents only seventeen consents to immunization were obtained.

Nine of the children who were "immunized" later had a mild form of diphtheria. Fifteen others who had negative Schick reactions were admitted to the hospital as patients with diphtheria, but twelve of these proved not to have diphtheria.

TENNEY, Madison, Wis.

ENCEPHALITIS FOLLOWING CHICKEN-POX. REGINALD LIGHTWOOD, Proc. Roy. Soc. Med. **28**:1192 (July) 1935.

A case of encephalitis following chickenpox in a child of 9 months is reported.

WILLIAMSON, New Orleans.

PROPHYLAXIS OF ASSOCIATED ERUPTIVE FEVERS. P. GAUTHIER, Bull. Assoc. internat. de pédiat. prevent. **2**:17, 1935.

The simultaneous appearance of two eruptive fevers is not uncommon; indeed, cases in which measles and scarlatina are concurrent are frequently observed. Such cases are not so serious as is sometimes maintained, yet it is necessary to take such measures as will prevent them completely. It is much easier to insure the isolation of patients than to solve the problem of the nursing staff. A sufficient number of properly trained nurses is essential in order to avoid the risk of secondary infection of patients. Serum prophylaxis should also be used in certain cases.

AMESSE, Denver.

CLINICAL DETERMINATION OF THE NECESSARY DOSE OF SERUM IN THE TREATMENT OF DIPHTHERIA. WILLEMIN-CLOG and MULLER, Bull. Soc. de pédiat. de Paris **32**:99 (Feb.) 1934.

The treatment and results obtained in a fairly large number of cases of diphtheria are tabulated and summarized. The conclusions reached are as follows: In benign, moderately severe and severe cases 400, 800 and 1,200 units, respectively, per kilogram of body weight should be administered. Whenever possible, 10 cc. of unconcentrated serum should be injected intravenously, and the remainder should be given intramuscularly and subcutaneously. If after twenty-four hours the pseudomembrane has progressed and the symptoms are worse, a second injection should be given to make up the amount recommended for severe cases. The moderate dose is sufficient for ordinary diphtheritic croup involving the larynx, but in cases in which the infection has descended into the trachea and bronchi and in those in which the pseudophlegmonous type of angina is present the largest dose should be injected. Excluding the patients who died, those who received treatment too late and those who could not be followed long enough to warrant conclusions, thirty-eight were given the largest dose of serum and thirty-eight

were given the small or medium dose. Of the former group, seventeen, i. e., 45 per cent, had complications, while only five of the latter group, or 19 per cent, had complications. The report concludes by suggesting that it would be interesting to determine statistically whether these figures supply evidence against the advisability of administering very large doses of serum.

BENJAMIN, Montreal, Canada.

REAPPEARING MEASLES. H. ESCHBACH, Bull. Soc. de pédiat. de Paris **32**:423 (July) 1934.

A boy of 20 months, who was observed by the author, and a boy of 5 years, whose case was described by the parents, showed a typical rash of measles during the first day of the eruption. On the second day the rash in each case became very pale, coincidentally with the development of capillary bronchitis, and the condition of the patients was alarming. The following day the rash reappeared in its characteristic hue in the two children, and both recovered after a few days without any further trouble. It is considered a sound belief that if the rash reappears in the course of measles, it is of serious import. The explanation of the phenomenon is that circulatory collapse occurs, which deprives the surface of the body of its normal blood supply, and therefore the rash is not the usual color. With the reestablishment of an adequate circulation, if the patient survives, the rash reassumes its reddish hue and then pales gradually in the characteristic manner as the patient recovers. Mustard plasters and the inhalation of oxygen are recommended for the treatment in such cases, and convalescent serum, which was administered to the smaller child, is considered of benefit.

BENJAMIN, Montreal, Canada.

PRACTICAL CONSIDERATIONS REGARDING AN EPIDEMIC OF "LARVAL" DIPHTHERIA. G. V. BRIZIO, Osp. maggiore **23**:97 (Feb.) 1935.

The author remarks on the frequent occurrence of diphtheria in Italy in spite of immunization with serum and active immunization. He is especially skeptical as to the effectiveness of the latter and calls attention to the harmfulness of the negative phase, which is frequently seen in Italy. He reports an epidemic of forty-three cases of angina, in which diphtheria bacilli were generally found in the pharyngeal discharge. The condition proved to be highly contagious and commonly included the entire household. In some instances the diphtheritic assault was apparent only in congestion and lacunar lesions, showing the importance of studying the etiology of such conditions.

VINTON, New York.

PERSISTENCE OF DIPHTHEROTOXIN IN THE SUBCUTANEOUS TISSUE OF GUINEA-PIGS: AN ANSWER TO DRS. D'ANTONA AND VALENSIN. M. PAVIA, Pediatria **43**:703 (June) 1935.

Pavia refers to a previous contribution and adds further data to disprove the contentions of d'Antona and Valensin on the subject, which appeared in the April 1935 issue of *La Pediatria*.

ABSTRACTER'S NOTE.—The article of d'Antona and Valensin was abstracted for the AMERICAN JOURNAL OF DISEASES OF CHILDREN.

SIGNORELLI, New Orleans.

LABORATORY METHODS IN THE DIAGNOSIS AND PROPHYLAXIS OF DIPHTHERIA. MOISES CHEDIAK, Arch. de med. inf. **4**:73 (June) 1935.

Chediak describes the laboratory methods employed in the clinic for the diagnosis and prophylaxis of diphtheria and comments on their interpretation and their clinical limitations as an appreciable aid in diagnosis and treatment.

SANFORD, Chicago

EXTRAPHARYNGEAL COMPLICATIONS OF DIPHTHERIA. ROBERTO VALDÉS DÍAZ, Arch. de med. inf. **4**:92 (June) 1935.

Most of the extensive processes of diphtheria are relatively benign. The association of the bacilli with streptococci causes serious complications. Paralysis is due to the invasion of nerve centers by toxins. To prevent this, patients should receive diphtheria toxoid, together with adequate amounts of serum.

SANFORD, Chicago.

TREATMENT OF DIPHTHERIA. JESUS ALFREDO FIGUERAS, Arch. de med. inf. **4**:104 (June) 1935.

The author agrees with Inclán in recommending the simultaneous use of diphtheria antitoxin and specific vaccine therapy. The latter prevents postdiphtheritic paralysis and other complications not checked by the serum. He also pleads for a general campaign of immunization with Ramon's toxoid.

SANFORD, Chicago

INORGANIC PHOSPHORUS IN DIPHTHERIA. ISAAC NATIN and CORNELIA DE RIN, Med. de los niños **36**:165 (June) 1935.

The inorganic phosphorus content of the blood in diphtheria varies between 3 and 6 mg. per hundred grams. It was not possible to establish a relationship between the phosphorus content of the blood and the gravity of the disease.

DWYER, Kansas City, Mo.

CHEMOTHERAPY IN THE TREATMENT OF ERYSIPELAS IN CHILDHOOD. L. GMELIN, München. med. Wchnschr. **82**:221 (Feb. 7) 1935.

Gmelin treated ten children with erysipelas with a proprietary dye preparation which is the chloride of 4 sulfonamide—2, 4 di-amino-azobenzol. The dosage was from 5 to 20 cc. of a 0.25 per cent solution injected intravenously or tablets of 0.3 Gm. given three times a day by mouth. The temperature dropped on the second or third day of treatment, and there was a concomitant improvement in the general symptoms. Most patients were cured in less than eight days, but in one case the condition lasted twenty-six days. There were no deaths. The treatment was more effective than others which had been tried previously.

BRAHDY, Mount Vernon, N. Y.

AN INFREQUENT COURSE OF PERTUSSIS ENCEPHALITIS. B. WEISNER, München. med. Wchnschr. **82**:786 (May 16) 1935.

Pulmonary conditions are the most frequent complications of pertussis. The complications next most often encountered are those involving the nervous system. Convulsions, encephalitis and injury to the spinal cord or peripheral nerves may be due to toxin, bacteria or hemorrhage. Weisner states that in spite of the large number of cases of pertussis relatively few complications referable to the nervous system develop. He reports the case of a 3½ year old girl with pertussis and extensive encephalitis. After seven weeks the child left the hospital entirely well.

BRAHDY, Mount Vernon, N. Y.

TYPES OF DIPHTHERIA BACILLI AND THEIR RELATION TO CARRIERS. K. W. CLAUBERG, München. med. Wchnschr. **82**:944 (June 14) 1935.

Clauberg made an interesting study of the distribution of the three types of diphtheria bacilli—gravis, mitis and intermedius. Among 665 patients the types were divided as follows: gravis type, 468; mitis type, 159; intermedius type, 28.

and mixed or doubtful type, 10. Four hundred and two carriers from the general population harbored the three types of bacilli as follows: gravis type, 89; mitis type, 28; intermedius type, 12, and mixed or doubtful type, 14. In the clinical cases the gravis type was about three times as prevalent as the mitis type, whereas in the carriers the mitis type was more than three times as prevalent as the gravis type. An analysis in 18 cases in which death occurred in a group of 120 patients showed that the gravis form was isolated in 17 of the patients and the intermedius form was isolated in the other patient. Similar results have been reported by other investigators. A group of 169 carriers who were in contact with patients with diphtheria showed a different distribution than the carriers taken from the population at large. Those in contact with patients showed the types as follows: gravis type, 126; mitis type, 11; intermedius type, 30, and doubtful type, 2.

Most patients in whom diphtheria develops contract it from carriers. Since an overwhelming number of persons are carriers, Clauberg suggests that only those harboring the gravis type of organism be considered as potential sources of infection.

BRAHDY, Mount Vernon, N. Y.

OBSERVATIONS ON DIPHTHERIA IMMUNIZATION WITH SINGLE INJECTION OF ALUM TOXOID. DANIEL G. LAI, Chinese M. J. **49**:340, 1935.

Lai, a physician at a health station in Shanghai under the department of health of the National College of Shanghai, reports that single injections of Peiping alum toxoid have been given to 489 persons with positive Schick reactions, most of whom were of school age. Only 70 per cent returned for another Schick test. The summary of results shows that the majority had local reactions; 6 per cent had general reactions of fever, headache and malaise, and 62.6 per cent gave negative reactions in five months. The conclusion is that not enough protection is given by one dose; at present two doses are being tried, and the results will be reported later.

NEFF, Kansas City, Mo.

AN EPIDEMIC OF POLIOMYELITIS. U. NORDWALL, Acta pædiat. **17**:508, 1935.

Three possible modes of spread have been suggested to account for the dissemination of the virus of infantile paralysis. The oldest concept is the contact theory of Wickman, and the second hypothesis is a modification to include the agency of an intermediary host. The newest explanation is that of Kling, who asserts that the disease may be borne by water.

Nordwall has analyzed carefully his experience in a fair-sized epidemic of poliomyelitis, which occurred in the neighborhood of LidKöping, Sweden, during the early part of the autumn of 1934. He concludes that contact infection is the rule, not the exception, in the epidemiology of poliomyelitis.

MCCUNE, New York.

Acute Infectious Diseases

BRUCELLOSIS IN MAN: TREATMENT WITH A NEW ANTI-SERUM. W. B. WHERRY, A. E. O'NEIL and LEE FOSHAY, Am. J. Trop. Med. **15**:415 (July) 1935.

The authors report twenty cases of brucellosis in man in which the disease was treated with a new antiserum which was prepared in goats.

No conclusions are drawn from the studies because of the small number of cases studied. However, the authors think that the serum had a definite value when used early enough, because some of the patients became afebrile in from three to twenty-one days and asymptomatic in from seven days to six weeks, were able to resume their customary occupations in from eight days to two months and remained well for periods of observation of from four to twenty-nine months. The authors believe that their few complete failures were due to inadequate potency of the serum, insufficient doses, the use of antiserum of too narrow valence and to attempts to treat infections of long standing.

BURPEE, Augusta, Ga.

RESEARCHES ON TETANUS: III. FURTHER EXPERIMENTS TO PROVE THAT TETANUS TOXIN IS NOT CARRIED IN PERIPHERAL NERVES TO THE CENTRAL NERVOUS SYSTEM. JOHN J. ABEL, B. HAMPIL and AUGUSTE E. JONAS JR., Bull Johns Hopkins Hosp. **56**:311 (June) 1935.

In earlier papers the authors presented many facts in support of the belief that the toxin of Clostridium tetani is not transported in peripheral nerves to the central nervous system but is distributed throughout the body by the blood stream only.

The experiments reported here show that it is possible to inject effective doses of tetanus toxin into the sciatic nerve of a dog without the production of local tetanus in any of the muscles innervated by this nerve and without the production of any other symptoms of tetanus anywhere in the body. When equivalent or smaller doses of toxin were injected intramuscularly, local tetanus always appeared after the usual period of incubation.

From a consideration of the data, the authors conclude that so far as the toxin is absorbed by the hemal and, more especially, by the lymphatic capillaries at the seat of the natural infection in tetanus, it can be carried to the various tissues of the body, including those of the central nervous system, only by way of the arterial blood stream.

LYTTLE, New York.

CLINICAL RESULTS IN THE TREATMENT OF MALARIA WITH COMBINATIONS OF QUININE, ATABRINE AND PLASMOCHIN DURING FOUR YEARS' EXPERIENCE. EDWARD C. MITCHELL and DAVID W. GOLTMAN, South. M. J. **28**:536 (June) 1935.

The authors are of the opinion that atabrine and plasmochin have a distinct place in the treatment of malaria. In the estivo-autumnal type of malaria, plasmochin acts on the sexual forms of the parasite but has little, if any, value in the treatment of the asexual type. Plasmochin produces various complications, which are painful and sometimes dangerous when excessive doses are used. The action of plasmochin with quinine is synergistic and not antagonistic.

In order to cure malaria of the estivo-autumnal variety, plasmochin must be used in combination with atabrine, quinine, or some quinoline derivative. The value of this drug in the eradication of malaria is to destroy the sexual form in the carrier.

The authors have noticed no painful or dangerous complications from the use of large dosages of atabrine. The only untoward effect observed was the yellow pigmentation of the skin. When used with plasmochin, atabrine appears to be an ideal combination, both theoretically and practically.

Quinine, or some quinoline derivative, is still necessary in the treatment of malaria in some instances, but the authors advise against the intravenous use of quinine on account of the danger of the procedure. In their opinion, the main benefit of plasmochin and atabrine appears to be that in most instances one can accomplish in five days a course of treatment that formerly extended over a period of weeks and months. Neither drug is dangerous if properly used.

SCHLUTZ, Chicago.

UNDULANT FEVER IN SCOTLAND. C. P. BEATTIE, J. SMITH and W. J. TULLOCH. Lancet **1**:1427 (June 22) 1935.

An account is given of ninety-seven cases of undulant fever occurring in Scotland between 1929 and 1934. Of these, fourteen were those of persons who had contact with animals or meat, and in the remainder infected milk appears to have been the cause of the illness. The disease was most common among young adults. Five cases were encountered in persons between the ages of 10 and 20. The average duration of the illness was ten weeks. An analysis of the signs and symptoms of the disease showed their complexity. The mortality for the series was 4.1 per cent.

LANGMANN, New York.

THE TREATMENT OF TETANUS WITH OBSERVATIONS ON THE FATE OF INJECTED ANTITOXIN. LESLIE COLE and E. T. C. SPOONER, Quart. J. Med. **4**:295 (July) 1935.

Cole and Spooner present results obtained in the treatment of twenty-one patients with tetanus, ten of whom were children. Eleven recovered.

The rate of disappearance of injected antitoxin was investigated in four cases after the intravenous injection of a single dose of 200,000 units. Seven days after injection 10 units per cubic centimeter of blood remained; at the end of fourteen days between 3 and 5 units of antitoxin per cubic centimeter of blood was demonstrated.

It is suggested that a diet of 2,000 calories per day should be given. The value of tri-bromethanol in amylene hydrate is emphasized; experience with the administration of moderately "lissive" (pharmacologic quality of removing pathologic rigidity without reducing voluntary power) sample of curare is recorded, and the possibilities of this treatment are discussed.

BRADFORD, Rochester, N. Y.

TREATMENT OF ACUTE RHEUMATISM. JOHN EASON, Tr. Med.-Chir. Soc. Edinburgh, 1935, p. 129; in Edinburgh M. J., July 1935.

Eason believes that the panorama of acute rheumatism through the sixty years' use of salicyl compounds is impressive. The facts are, however, depressing and indicate that the orthodox treatment of today may be considered a crime tomorrow. Eason's statistics show that one third of the patients with real rheumatism get little benefit from treatment with salicylates; the onset of cardiac changes is not prevented and these changes continue to develop insidiously. Both children and adults have frequent recurrences, as many as six being fairly common, in spite of salicylates. The disease is one of the deadliest; more children between 8 and 15 years of age die of heart disease than of any other one cause. The popularity of salicylates has prevented the widespread urge for progress toward adequate treatment.

In Edinburgh a severe epidemic of scarlet fever and the presence of much erysipelas coincided with an increased rate of admission to hospitals of persons with acute rheumatism and chorea. The hemolytic streptococcus is found twice as frequently as the nonhemolytic streptococcus when the throat is swabbed during the course of acute rheumatism. The usual development of acute rheumatism is a history of streptococcic sore throat, a silent period of from ten days to three weeks and then the appearance of a more or less sudden reaction, evidenced by fever, arthritis or other symptoms of rheumatism.

The author has been using serum for the past four years; this is a concentrated and refined scarlatinal streptococcus antitoxin. Repeated doses resulted in cure of 73 per cent of the 37 patients. In one instance a late repetition of a dose of serum was followed by death, which was possibly due to anaphylaxis. Most of the patients have serum rashes.

NEFF, Kansas City, Mo.

CLINICAL STUDIES OF GRIP IN NURSLINGS. C. TZAVELLOS, Arch. de méd. d. enf. **38**:206 (April) 1935.

In the author's investigation of influenza in infancy it was found expedient to first exclude the usual seasonal infections found in nurseries, such as rhinopharyngitis, bronchitis and the milder forms of bronchopneumonia.

Epidemic grip is charactertized clinically by a very short period of incubation, a brusque onset, rapidity of evolution and the frequency of pulmonary invasions such as bronchopneumonia. It is extraordinarily contagious; visitations, such as the one of 1918, ravaged the world and within two years claimed 20,000,000 victims. Its etiology is not clearly understood, and the absence of dependable criteria is particularly felt in the domain of early childhood.

Chauffard noted that infants frequently live in an infected milieu without contracting the disease and argued that under 1 year of age they are probably not susceptible; the rôle of heredity and the influence of maternal feeding have been discussed in this connection. Tzavellos, however, has found abundant evidence of susceptibility in nurslings and has confirmed the observations of Comby and of Achard, Leblanc and Laveran, who found that under similar conditions the immunity of infants is more apparent than real. A number of case histories is included to sustain this contention.

AMESSE, Denver.

TYPHOID AND PARATYPHOID IN CHILDREN. P. EIVINE and S. VOURMANN, Arch. de méd. d. enf. **38**:469 (Aug.) 1935.

It would appear that typhoid and paratyphoid still occupy an important place in the practice of pediatrics in Russia. At the Institute of Medicine in Kieff one hundred and twelve cases of typhoid and eleven cases of paratyphoid were under observation during the period 1931 to 1933. Many of the patients were nurslings. The histories of patients are discussed at length to illustrate the various types of these disorders, and the laboratory notes and reports of the pathologic findings are given. Among the complications found in this series, myocarditis and bronchitis are stressed as occurring frequently. The mortality was 4.8 per cent.

AMESSE, Denver.

BALANTIDIASIS IN INFANCY. P. TIMPANO and G. CASTORINA, Pediatria **43**:449 (April) 1935.

The authors report that in their examinations of children suspected of amebic infection they have encountered four cases of infestation with Balantidium coli. These are discussed clinically and from the standpoint of laboratory study, and attention is invited to the possibility that such cases are met with more often than is ordinarily suspected.

SIGNORELLI, New Orleans.

RECOVERY FROM MENINGITIS OCCURRING IN THE COURSE OF INFLUENZA. H. M. C. POORTMAN, Maandschr. v. kindergeneesk. **4**:342 (May) 1935.

A typical case of meningitis occurring in the course of influenza in a girl of 2½ years is described. Treatment was carried on according to the slightly modified method of Ward (1932), with the result that after several weeks recovery commenced. Relapses occurred, but slowly the child recovered until only total deafness remained.

VAN CREVELD, Amsterdam, Netherlands.

Chronic Infectious Diseases

THE TREATMENT OF TUBERCULOSIS OF THE SPINE IN YOUNG CHILDREN. EDWARD L. COMPERE and JEROME T. JEROME, Ann. Surg. **102**:286 (Aug.) 1935.

The modern treatment of tuberculosis of the bones and joints includes recognition first of the need for rest of the body as a whole, and, in particular, of the diseased joint. No apparatus can give immobilization which is comparable to that of satisfactory fusion of a tuberculous joint.

An objection to attempts to produce fusion and an explanation of the failure to obtain satisfactory results in young children have been a prevailing opinion that there was not enough bone in the spinous processes and laminae to obtain an adequate arthrodesis of the spine. The authors disagree with this view and believe that failure has been due to faulty technic. They believe that it is possible adequately to splint the spine of children at any age, even at birth, if the operation is performed carefully, enough bone is used and the grafts are long enough to

reach at least two normal healthy vertebrae above and two below the diseased vertebral bodies.

Their operative technic is given in detail, with a summary of their cases.

BANTIN, Omaha.

THE DECLINING DEATH RATE FROM TUBERCULOSIS IN CHILDREN. R. E. BOYNTON, J. A. M. A. **104**:1875 (May 25) 1935.

The author made an analysis of the deaths from tuberculosis in Minnesota from 1915 to 1932. In Minnesota, where BCG vaccination has not been used, the mortality rates in children due to tuberculosis are lower and have decreased more rapidly than the rates in Sweden, where the vaccine was used. Although there has been a decrease of 80 per cent in the mortality rate in infants under 1 year of age, the death rate still remains higher in this age group than in any group under the age of 15 years. Tuberculosis of the lymph nodes, bones and joints is a negligible cause of death in children under 15 years of age. Tuberculous meningitis, pulmonary tuberculosis and miliary tuberculosis are the more important causes of death in children.

BONAR, Salt Lake City.

TUBERCULOSIS DUE TO BOVINE TUBERCLE BACILLI. A. STANLEY GRIFFITH and W. T. MUNRO, Brit. M. J. **2**:147 (July 27) 1935.

Two families in which there was tuberculous disease are reported on. Extensive experiments were performed, and observations at autopsy are described. The conclusion is that both families were infected with bovine tubercle bacilli.

ROYSTER, University, Va.

TUBERCULIN ALLERGY IN ACUTE INFECTIOUS DISEASES: A STUDY OF THE INTRACUTANEOUS TEST. J. S. WESTUSTER, Quart. J. Med. **4**:203 (July) 1935.

The author performed the Mantoux test at various intervals during the course of the illness in 2,000 cases of the acute infectious diseases. The group, studied at the Park Hospital in London, included measles, scarlet fever, chickenpox, diphtheria and whooping cough.

Measles and scarlet fever caused a temporary depression of sensitivity to tuberculin in about one half of the cases. The period of depressed allergy usually lasted for a week from the appearance of the rash.

Chickenpox, diphtheria and whooping cough were not found to have an appreciable effect on the sensitivity to tuberculin.

In the case of measles and of scarlet fever there was a direct relationship between the extent to which sensitivity was depressed and the intensity of the rash.

BRADFORD, Rochester, N. Y.

PULMONARY TUBERCULOSIS IN ADOLESCENCE AND YOUTH. P. F. ARMAND-DELILLE, Tubercle **16**:337 (May) 1935.

This paper deals only with tuberculosis due to reinfection, which is the most common manifestation in adolescence. The development of pulmonary tuberculosis in early adolescence always means local reinfection of an organism which suffered the primary infection in infancy. In most cases this reinfection does not come from without but is due to autoreinfection. Even contact with carriers of the bacillus does not properly provoke reinfection, but it probably determines, as does an injection of tuberculin, the reactivation of latent foci.

Three pathologic types of pulmonary tuberculosis characterize the disease at this age: (1) Splenopneumonia, epituberculosis or perifocal reaction, a benign type the pathogenesis of which is not yet fully explained. (2) Pneumonic type,

characterized by a rather abrupt onset, early formation of cavities and, probably, death, unless the disease is recognized very early and treated heroically. (3) Fibro-ulcerous type, the onset of which is less dramatic, more insidious and, because of this, often more dangerous. Rapid extension is almost certain to occur if complete treatment is not instituted early, the disease often terminating in the so-called "galloping tuberculosis."

In addition to these graver types of the disease a more benign form, incipient tuberculosis, is sometimes encountered. It is usually found on roentgen examination of the chest as a routine. As a rule, this form heals completely, especially if rest is enjoined.

The rest cure is essential for all types of adolescent tuberculosis, but Armand-Delille declares that the only really effective treatment is collapse therapy.

EUGENE SMITH, Ogden, Utah.

Diseases of Blood, Heart and Blood Vessels and Spleen

THE NEUROLOGIC ASPECT OF LEUKEMIA. ROBERT S. SCHWAB and SOMA WEISS, Am. J. M. Sc. **189**:766 (June) 1935.

The clinical course in an unusual case of acute lymphatic leukemia is reported. The manifestations were facial diplegia and a spinal fluid which under elevated pressure contained 2,000 cells and an increased amount of protein. The usual clinical manifestations, including the typical blood picture, developed later. A table showing the results of analyses of the spinal fluid in 10 cases of leukemia is presented. A review of the literature revealed 146 cases of leukemia with neurologic signs, excluding retinal involvement. It is estimated that only about 25 per cent of the patients with histologic evidence of leukemic infiltration of the central nervous system show neurologic signs. An analysis of 334 cases of leukemia in Boston revealed an incidence of 20.5 per cent with neurologic signs, excluding retinal lesions. The most frequent neurologic signs include bilateral palsies of the seventh and sixth nerves, with less frequent involvement of the fifth, eighth, ninth, tenth, eleventh and twelfth nerves. Absence of the deep reflexes and pyramidal signs, paresthesias and signs of meningeal irritation have been noted. In 73.6 per cent of 34 cases the spinal fluid showed abnormal findings as already mentioned.

HENSKE, Omaha.

FAMILIAL PURPURA; REPORT OF TWO CASES. FREDERICK RANDOLPH BAILEY and KENNETH R. MCALPIN, Am. J. M. Sc. **190**:263 (Aug.) 1935.

Two cases of a familial chronic hemorrhagic diathesis in which the bleeding time was prolonged but the clotting time and number of platelets were normal are described. "Hereditary thrombasthenia" is usually employed to describe this syndrome, but recently "constitutional thrombopathy" has been suggested. Treatment should be conservative. Splenectomy is contraindicated. If the patient successfully passes the critical stage (15 years), the prognosis is excellent. The bleeding tendency usually manifests itself in infancy or childhood. HENSKE, Omaha.

AGRANULOCYTOSIS. HENRY JACKSON JR., Ann. Int. Med. **9**:26 (July) 1935.

Agranulocytosis is a disease entity. Definite criteria are listed, the recognition of which is considered essential for the correct diagnosis of the condition. Emphasis is placed on the fact that leukopenia alone is not sufficient evidence for the diagnosis of agranulocytosis.

Aminopyrine is not considered the sole or even the most important cause of the disease. It is suggested that an endocrine factor may be responsible for the condition in some cases but that in all probability the disease may be due to various etiologic agents.

Pentnucleotide in full doses is the most effective treatment. The necessity for adequate doses is particularly stressed.

READING, Galveston, Texas.

THE USE OF THE SEDIMENTATION REACTION AND THE SCHILLING HEMOGRAM IN SOME PEDIATRIC CONDITIONS. ALEXANDER T. MARTIN and SAMUEL L. ELLENBERG, Arch. Pediat. **52**:285 (May) 1935.

The results of the simultaneous application of the sedimentation test and the Schilling hemogram are compared with the results following the use of either alone. The authors believe that the simultaneous use of the test and hemogram affords a better appreciation of the status of a condition than the use of either alone. These two tests appeared to show a more or less definite relationship to one another in the presence of infection. The Schilling hemogram differentiates more clearly between types of infection and denotes the subsidence of a pathologic process more accurately than the sedimentation test. The sedimentation test is a useful guide in determining the period of convalescent care required by patients recovering from a severe illness.

WADDELL JR., University, Va.

HEMOLYTIC ICTERUS WITH INFANTILISM. WANN LANGSTON, South. M. J. **28**:316 (April) 1935.

Langston reports a case of hemolytic ictero-anemia associated with skeletal and genital infantilism. So far as he could determine from the history, the onset of the two conditions was simultaneous. Hence a causal relationship of the ictero-anemia to the infantilism is suggested.

The hemolytic ictero-anemia was relieved by splenectomy, with a characteristic response. Following recovery from the operation, hormone therapy was instituted. Twenty-seven months after this therapy had been instituted, normal height (for the patient's family) and normal genital development had been attained. The increase in height in this period of time was 6½ inches (16.5 cm.). Roentgenograms suggested that closure of the epiphyses was progressing slowly, if at all, and that further increase in height could be expected.

The young man's general health is now excellent, and he is able to carry on the work of a normal person.

SCHLUTZ, Chicago.

THE GASTRIC SECRETION IN ANAEMIA. J. W. OGILVIE, Arch. Dis. Childhood **10**:143 (June) 1935.

The results of fractional gastric analysis in a series of thirty-four children with anemia show that there is in many cases a marked diminution in the secretion of free hydrochloric acid and in the total acidity of the gastric juice. The other constituents of the gastric juice do not differ significantly from those of the gastric juice of a series of normal children. No correlation was noted between either the number of red cells or the hemoglobin and the maximum secretion of free acid. There seems to be a close association between defective secretion of hydrochloric acid and the hypochromic type of anemia.

KELLY, Milwaukee.

TREATMENT OF PERICARDITIS. J. FREUD, D. LUWISCH and F. OESTREICHER, Brit. M. J. **1**:1231 (June 15) 1935.

The various forms of pericarditis are described, with an account of the authors' experience with this condition, their methods of treatment and their opinion on the subject.

ROYSTER, University, Va.

THE ANEMIAS OF INFANCY AND CHILDHOOD. LEONARD G. PARSONS and W. CAREY SMALLWOOD, Practitioner **134**:298 (March) 1935.

In presenting this interesting subject the authors begin by discussing the difference in the blood-forming mechanism of the infant and the child and that of the adult. A brief review of the status of the erythron at the time of birth is given. The factors that operate to produce the so-called physiologic anemia of the new-born are clearly described.

As to signs and symptoms of anemia, it is thought that symptoms referable to anemia are rarely observed in early life unless the hemoglobin falls below 40 per cent. The color of the skin varies in different types of anemia. The writers state: "In nutritional anaemia the skin typically has the whiteness of a sheet, whereas the patient with haemolytic anaemia usually has a café-au-lait appearance, and when haemolysis is severe the skin and conjunctivae may even be icteric." Again, in leukemia the skin may have a dirty-white waxen appearance. In the severe anemias, soft systolic heart murmurs are common and may be associated with tachycardia. Marked irritability and restlessness and, occasionally, air hunger and edema of the extremities may be found in advanced cases. When anemia is associated with a reduced platelet count, purpuric eruptions of the skin and hemorrhages from mucus membranes may be present. An enlarged liver or spleen may also be a finding.

The authors classify the anemias of infancy and childhood (excluding the leukemias) by dividing them into two main groups. The first consists of the hypoplastic, anhemopoietic or deficiency anemias. Under this grouping the following five types are discussed in detail: (*a*) nutritional anemia, or the so-called milk anemia of infancy; (*b*) the anemia of celiac disease; (*c*) iron deficiency anemia; (*d*) the anemia of scurvy, and (*e*) other rare deficiency anemias, including those of hypothyroidism and infection caused by Dibothriocephalus latus. Particular attention is given to nutritional anemia of infancy, as it is the most widely spread and important of the anemias of early life.

The second main group of anemias is that of the hemolytic type. This group is characterized by destruction of the circulating blood cells and may or may not be associated with damage to their precursors in the bone marrow. The importance of the conception of the blood as a living tissue including not only the circulatory adult elements but also the important predecessors in the bone marrow is noted. The term erythron as suggested by Boycott for this whole red blood cell mechanism is mentioned, and the authors suggest the word "erythronoclastic" to represent the effect on the marrow cells of those agents responsible for hemolysis of circulating cells. Under the second main grouping the following subgroups of the hemolytic anemia of the new-born and allied conditions are given: (*a*) icterus gravis neonatorum, (*b*) hemolytic anemia of the new-born without icterus gravis and (*c*) hemolytic anemia with congenital hydrops foetalis. The etiology, general characteristics and treatment are given careful consideration. The second main division under hemolytic anemias is that of hemolytic anemia of later infancy and childhood. In this group the following are discussed: the acute hemolytic anemia of Lederer, the chronic form of hemolytic anemia represented in the von Jaksch's syndrome, the even more chronic familial hemolytic icterus or acholuric family jaundice and the condition called sickle cell anemia. The etiology, as well as the treatment and the use of transfusion, is given special consideration.

SAPPINGTON, San Francisco.

BLOOD PRESSURE IN CERTAIN ACUTE INFECTIONS OF CHILDHOOD. P. EIVINE and L. ZELDITSCH, Arch. de méd. d. enf. **38**:133 (March) 1935.

The determination of the blood pressure in routine examination has not achieved in children's clinics the importance accorded in the investigation of disease in adults; this has been due partly to the fact that, in the very young, diseases of the cardiorenal vascular system and of the endocrine glands are not so common as among older persons, but principally to the difficulty of estimating accurately the blood pressure of infants. The authors believe, however, that this difficulty has been greatly exaggerated, and they propose a method much similar to that of Rosenthal, in which the Riva-Rocci apparatus and the cuff of Sahli are employed. In a series of 149 subjects varying in age from birth to 13 years and suffering from various disorders, whose histories are appended, the following conclusions were drawn:

1. There is no difference between the sexes up to puberty.

2. Elevation of temperature does not materially influence the blood pressure in children.

3. The blood pressure in healthy children is more or less labile; it is stable in some, and there are oscillations of from 5 to 10 mm. in others.

4. The Riva-Rocci method is preferred to that of Korotkoff.

5. The pneumonias, especially of the septic type, often are accompanied by a significant rise in the blood pressure; in meningitis the range is somewhat lower, while in typhus fever there is a notable drop.

6. The tonus of the vessels and the integrity of the capillary network are the essential factors in the production of pressure.

7. Variations of the maximal and minimal pressures are not always parallel.

8. Determination of the blood pressure is important in prognosis and in the selection of therapeutic measures.

AMESSE, Denver.

ALEUKEMIC HEPATOSPLENIC MYELOSIS: DIAGNOSIS BY SPLENIC PUNCTURE. P. CARNOT, J. CAROLI and A. BUSSON, Paris méd. **1**:449 (May 18) 1935.

The authors report two cases, both in adults, in which the diagnosis of myeloid leukemia was made. The peripheral blood showed anemia but no significant change in the white cells. Both the liver and the spleen were enlarged.

LESLIE, Evanston, Ill.

THE DISTRIBUTION OF BLOOD GROUPS IN COMPANIA. VINCENZO MORICCA, Pediatria **43**:288 (March) 1935.

The theories, practical applications and especially the importance assumed by blood grouping in recent years are discussed with particular reference to their regional and ethnic distribution. The author's contribution is a statistical analysis of observations on 450 children, including 221 boys and 229 girls. He summarizes the data as follows:

Blood Group	Boys	Girls	Percentage
I. Universal donors	93	108	44.65
II. A	82	77	35.35
III. B	37	32	15.35
IV. AB (Universal receivers, but donors belonging to members of same group only)	9	12	4.65
			100.00

Two per cent of the total number classified as members of the group AB were capable of receiving blood from donors of their own group as well as from universal donors and may furnish blood to members of their own group and to members of group IV.

SIGNORELLI, New Orleans.

HEMATOLOGIC RESEARCHES IN VIVO ON THE BONE MARROW IN INFANCY. F. TECILAZIC, Pediatria **43**:658 (June) 1935.

A comparative study of the bone marrow in full term and in premature new-born infants is reported. The author observed the hematocytologic behavior of the bone marrow in vivo in these two types of new-born infants during the first seven days of life and also made a comparative study of the peripheral blood. He concludes that no notable differences exist in the hematocytologic features of the bone marrow of full term and premature new-born infants.

SIGNORELLI, New Orleans.

HYPERCHROMIC ANEMIA OF THE CHLOROTIC TYPE IN A CHILD. GEORGES GUIMARES, Arch. de pediat., Rio de Janeiro **7**:381 (May) 1935.

This condition occurred in a child of 2 years. There was also considerable alteration of the lymphocytes. The cause was not found, and the condition did not respond to the usual treatment for anemia.

SANFORD, Chicago.

A Case of Acute Leukemia in a Child. Olavo Lustosa, J. de pediat., Rio de Janeiro **2**:181 (May) 1935.

A child 6 years of age presented the acute form of leukemia with anemia, hemorrhagic diathesis and enlargement of the liver and spleen. Death occurred in two months, in spite of transfusions. At the first examination of the blood there were only 17 per cent lymphocytes, but on the second examination there were 52 per cent. Sanford, Chicago.

Essential Hypertension in Childhood. Leonora Liebenam, Monatschr. f. Kinderh. **63**:171, 1935.

The author reviews the literature and various theories concerning hypertension in children. She then reports a case in which absolutely no cause of the hypertension could be discovered. Her diagnosis is that of essential hypertension, and as the child was greatly improved by a quiet, orderly regimen it is suggested that the etiology was psychic. Gerstley, Chicago.

Articular Symptoms in Juvenile Leukemia. Bernhard Fuchs, Monatschr. f. Kinderh. **63**:185, 1935.

A 3 year old child was taken acutely ill with fever and rapidly increasing pallor. Within a few weeks the joints of the feet and hands became swollen and painful. Within a short time the blood findings were those of typical lymphatic leukemia. Articular symptoms are rare in this disease, and Fuchs reminds one that the fever, the articular findings, the pallor and the palpable spleen might easily have been mistaken for signs of rheumatic fever. Gerstley, Chicago.

The Size of Red Blood Cells in Children. H. Fischer, Monatschr. f. Kinderh. **63**:194, 1935.

Investigations of the size of the red cells in healthy children showed them to have the same diameter as the red cells of adults, namely, from 7.15 to 7.65 microns. In cases of scarlet fever and measles and in thirty-seven cases of the juvenile form of tuberculosis microcytosis was found. In one case of acute yellow atrophy of the liver there was definite macrocytosis. In catarrhal jaundice the findings were indefinite. In twelve cases of secondary anemia there was also little change in the size of the red cells. Gerstley, Chicago.

Familial and Hereditary Anemias. Heinrich Lehndorff, Wien. klin. Wchnschr. **48**:748 (May 24) 1935.

Lehndorff discusses three forms of familial anemia: Oval cell anemia, sickle cell anemia and erythroblastosis. Only the oval cell type appears to be without particular significance. In all three types the erythrocyte has a pathologic form and the disease may occur in several generations. Negroes are especially susceptible to sickle cell anemia, and Italians to erythroblastosis. All three types are often combined with deformity of the skeleton; for example, there may be a tower-shaped skull in oval cell anemia. Hematologically there is in each type a hemolytic anemia the severity and prognosis of which depend on the degree of abnormality, dystrophy and fragility of the erythrocytes. In oval cell anemia the spleen is slightly enlarged; in sickle cell anemia it is quite large, and in erythroblastosis it is very large. Splenectomy is effective in the first type, less effective in the second type and without result in the third type. Abt, Chicago.

A Case of Infectious Mononucleosis. S. Salén, Nord. med. tidskr. **9**:592 (April 13) 1935.

A boy of 10 years fell ill on Jan. 1, 1934, with fever. On examination, on Jan. 7, enlarged glands on the neck and in the axillae and groins, extensive enlarge-

ment of the spleen and liver and paleness of the skin were noted. The red blood picture was normal. The white blood cells numbered 12,500, of which 78 per cent were mononuclears, partially of pathologic types. The patient was afebrile after ten days. Recovery was rather rapid. However, mononucleosis was still present four months later.

WALLGREN, Gothenburg, Sweden.

CONGENITAL ANEMIA. C. W. E. VELDHUYSEN, Maandschr. v. kindergeneesk. **4**:197 (Feb.) 1935.

Two cases of this condition are described, with an extensive review of literature.

VAN CREVELD, Amsterdam, Netherlands.

ACUTE HEMOLYTIC ANEMIA. J. GOUDSMIT, Nederl. tijdschr. v. geneesk. **79**:554 (Feb. 9) 1935.

The etiology of some forms of acute hemolytic anemia, especially of the so-called Lederer's type, is reviewed, and the author's observations in two cases are given. In connection with these the symptomatology is discussed, as well as the pathogenesis and the therapy, and some remarks are made as to the differential diagnosis.

VAN CREVELD, Amsterdam, Netherlands.

Diseases of the Nose, Throat and Ear

QUINSY IN A YOUNG INFANT. HARRY L. BERMAN, Arch. Otolaryng. **19**:710 (June) 1934.

Peritonsillar abscess is rare in children, and it is especially so in infants. A search of the literature revealed no record of typical quinsy in an infant as young as the one whose case is reported.

A child born on July 6 was taken ill on September 11, with fretfulness, fever and swelling at the angle of the jaw on the right side. The patient breathed and swallowed normally. The temperature on admission to the hospital was 38.2 C. (100.7 F.). The posterior pharyngeal wall was normal. No nasal or aural discharge was present. The right anterior pillar and the soft palate were red and bulging forward in the superior region. The nodule at the angle of the jaw was firm and did not fluctuate. The remainder of the physical examination gave essentially negative results. An incision was made through the anterior pillar and soft palate on the right side, no anesthesia being used, and considerable pus was evacuated. The temperature was normal the next day, and recovery was uneventful.

GREENWOOD, Chicago.

ACUTE AND CHRONIC OTITIS MEDIA, SINUS THROMBOSIS AND PETROSAL PYRAMID SUPPURATION. SAMUEL J. KOPETZKY, Arch. Otolaryng. **20**:396 (Sept.) 1934.

Under the problems concerned with acute lesions, the author states that Meltzer believes that the mastoid cells, when present, are arranged in a systematic manner, dependent primarily on the course and position of the lateral sinus. No hard and fast rule can be laid down as to the time when surgical intervention is most beneficial. Howell believes that paracentesis in itself is of very little value other than in relieving pain, that it does not prevent mastoiditis and that healing is no better after it than in cases in which it is not done. (The abstracter here calls attention to the fact that no mention is made of the future hearing in these cases.) Hastings holds that when paracentesis is correctly done and timed, there are fewer resultant operations, quicker and more complete healing and obviation of a chronic perforation in many instances. However, Kopetzky states that paracentesis does not prevent mastoiditis and that chronic evolution depends on the bone structure of the tympanic and mastoid areas and on whether or not the

original lesion attacks the epitympanic space. Chronicity does not generally develop following an acute lesion except in cases of the acute necrotic otitis of Wittmaack and of fistulas into the petrosal pyramid. Kopetzky condemns repeated paracentesis in an effort to avoid mastoid operations and states that it injures hearing.

The temperature curve is not to be considered an index of the severity or extent of the lesion. It may be low in severe cases, or the opposite may occur. Leidler believes that tachycardia is characteristic in patients with septic temperature curves and, especially at the onset of the lesion, is a grave sign.

Hofer divides otogenous infection in infants into: (1) the pyemic type, with multiple foci of infection, high fever, chills and the general picture of sepsis, and (2) the septic type, with a continuous high fever but with no demonstrable foci.

Karbowkdi, studying this lesion, chiefly in children with an allergic tendency, reports that: (*A*) the infection follows the blood channels and not the surface of the eustachian tube; (*B*) changes, especially in young children, are more frequently seen in the mastoid process, the middle ear being almost free from characteristic lesions, and (*C*) characteristic lesions are found only in pronounced cases and are in the internal as well as the middle ear.

Love reports nine cases of primary mastoiditis causing complications and points out that general sepsis may be present from this lesion when the drum is intact.

Tuberculous otitis media, Despons believes, is slower in evolving, and the duration of the acute stage is longer. One author believes that a radical operation should always be done. Kobrak thinks the hematogenous route is the avenue of invasion. He believes that a nonspecific trauma is paramount, that this damages the defensive mechanisms in the body and that the less virulent the acute infections are, the more the tuberculous factors assume the prominent rôle.

Syphilitic mastoiditis is described as a chronic condition with sequestra formation. The middle ear infections in syphilis are independent of the syphilitic infection, though the bone lesion is classified as syphilitic.

Kopetzky cites abscess formations in the lateral pharyngeal region as possibly secondary purulent collections due to gravitation from an unrelieved suppuration of the petrosal pyramid.

Attention is called to the fact that unless the diseased zygomatic root is cleaned out healing is delayed and complications may ensue.

The optimum time to operate for acute mastoiditis depends, of course, on the severity of the onset and on the rapidity of evolution, but in general it is well to wait until the patient has recovered from the prostration caused by the bacterial invasion and has walled off the local lesion. Kopetzky does not believe that there is a latent mastoiditis. He states a lesion is either active or is in a process of recession and healing.

One of the lesions of asymptomatic mastoiditis most often observed is that produced by so-called Streptococcus mucosus. The need of smears and cultures for identification is stressed.

Recurrent mastoiditis is classified as a recurrence of symptoms during the original postoperative period due perhaps to involvement of the zygomatic root, to sequestra formations or to breaking down of encapsulated areas with a subsequent stormy course. Reinfection of a healed wound from an operation on the mastoid is not recurrent and may be due to any number of causes. These are not clearly established, and the problem is still unsolved.

Pertinent to the treatment of chronic suppurative otitis media is Kopetzky's statement that this entity is a lesion with its genesis at birth in a disturbed pneumatization, while the inciting factors are infections during the exanthemas. Belief is expressed that the greater loss of hearing is contracted through the prolonged conservative treatment and that the later in life operation is necessary, the more established is the loss of hearing.

Kopetzky, commenting on cases of lesions of the petrous pyramid, divides them into two principal types: (1) those of enclosed, encapsulated empyemas of the

apex which lead to meningitis and (2) those in which, during the evolution of an acute infection of the middle ear, a chronic type of lesion develops, with resultant chronic otorrhea.

Vail believes that the great petrosal nerve through the sphenopalatine ganglion is the route of the transmission of orbital pain rather than the ophthalmic division of the cranial nerve.

GREENWOOD, Chicago.

BACTERIOLOGY OF ACUTE INFECTIONS OF THE MIDDLE EAR AND MASTOID. JOHN RANDOLPH PAGE, Arch. Otolaryng. **20**:447 (Oct.) 1934.

The author examined three hundred patients, taking cultures of material from the following regions: (1) surface of the drum, through a sterile speculum with a small sterile swab; (2) the canal, after sterilization with 95 per cent ethyl alcohol, which was found to be most effective; (3) the myringotome; (4) the lips of the wound immediately after incision of the drum, and (5) the eustachian tube, with a sterile wire loop through the eustachian catheter.

The results showed that 30.6 per cent of the infections were due to the hemolytic streptococcus and 17 per cent to type III pneumococcus. The author emphasizes the fact that 82 per cent of the patients with pneumococcic infections recovered without operation, which is in contrast to the reports of other authors. He states that these findings emphasize the fact that involvement of the mastoid depends not solely on the virulence of the infection but on the patient's resistance and the particular anatomic structure of the mastoid involved, which may tend to retention or expulsion of the infected material.

The author concludes with the interesting but controversial statement that almost three times as many mastoidectomies were necessary in the cases in which the drum ruptured spontaneously as in the cases in which myringotomy was performed before rupture occurred.

GREENWOOD, Chicago.

Diseases of Lungs, Pleura and Mediastinum

CONGENITAL CYSTS OF THE LUNG. JOHN P. SCOTT and ARTHUR D. WALTZ, Am. J. M. Sc. **189**:788 (June) 1935.

A case of congenital cystic disease of the lungs in a 4 month old infant is presented, with roentgenographic and autopsy observations. Microscopic structures suggest abnormal embryonic development.

HENCKE, Omaha.

THE USE OF THE DRINKER RESPIRATOR IN ASPHYXIA. HENRY RASCOFF, Arch. Pediat. **52**:414 (June) 1935.

Of a series of 487 infants delivered at the Beth-el Hospital in Brooklyn, the Drinker respirator was used in the treatment of 17 infants who were suffering from asphyxia. Twelve of these infants left the hospital at the end of ten days alive and well. The remaining 5 died of cerebral hemorrhage following prolonged labor and instrumental intervention. In the 12 surviving infants the period of absence of spontaneous breathing varied from one to twenty-three minutes. The picture of asphyxia of the new-born is described. Rascoff believes that the Drinker respirator is a necessary adjunct to a properly equipped delivery room and that on certain occasions it will prove a life-saving device.

WADDELL JR., University, Va.

PULMONARY INFARCT IN A CHILD. H. ROSENBLOOM and R. J. HENDERSON, Brit. M. J. **2**:64 (July 13) 1935.

A boy 10 years of age fell from a wall 6 feet (1.8 meter) high. The parents did not think that he was very ill, though he vomited during the night and felt drowsy the next morning. Two days afterward he had marked "frothing" at the mouth. A physician was sent for, but the child was dead before he arrived.

Autopsy showed a large and prominent wedge-shaped infarct occupying the entire middle lobe of the right lung. There was a thrombus blocking the branch of the pulmonary artery at the apex. There was no evidence of the origin of the infarct.

ROYSTER, University, Va.

PULMONARY ABSCESS CAUSED BY A FOREIGN BODY REMAINING IN THE BRONCHUS. J. GUISEZ, Bull. et mém. Soc. d. chirurgiéns de Paris **27**:176 (March 15) 1935.

A boy of 10 years was subject to a distressful hacking cough, chiefly at night. His temperature rose to 39 C. (102.2 F.), and his general condition became poor. On roentgenography the left lung appeared normal, as did the upper two thirds of the right lung. The lower third was completely opaque, and the mediastinum was drawn to the right. In the lower hilar region and pressing on the inferior part of the bronchus was an opaque mass of an irregular rectangular form with the long axis vertical, which resembled a sclerotic ganglion. It appeared to be a metallic fragment lying in the inferior part of the right bronchus, which had produced an inflammatory reaction in the neighboring lung tissue. The child denied that he had swallowed any foreign body. The fragment appeared to have been swallowed about two years earlier. It was easily extracted.

VINTON, New York.

NONTUBERCULOUS PNEUMOTHORAX IN AN INFANT, PRODUCING A SYNDROME DUE TO OBSTRUCTION OF THE SUPERIOR VENA CAVA. JEANNIN, Bull. Soc. de pédiat. de Paris **32**:289 (May) 1934.

An infant 2½ months old had bronchopneumonia which was complicated by the formation of a pulmonary abscess that ruptured into the pleural cavity and produced suffocative pneumothorax. She was relieved temporarily by the aspiration of air from the pleural cavity. Edema of the face and upper extremities developed. The tuberculin reaction was negative. At necropsy the left lung was completely collapsed and covered with fibrinous exudate, and the left pleural cavity contained a small amount of pus. The inferior part of the upper lobe contained an abscess the size of a large nut, situated close to the mediastinum, with a tear of the overlying pleura about 1 cm. in length. At the bottom of the abscess there was an opening into a bronchiole about 2 mm. in diameter. Both lungs showed areas of bronchopneumonia on section. The heart was almost entirely in the right half of the thorax. There were some areas of dry pericarditis at the base of the heart. There was no evidence of inflammatory change in the vena cava, and its lumen was not obstructed. The circulatory obstruction of the superior vena cava during life was explained as having been due to the extreme positive pressure in the left pleural cavity, which caused a marked shift of the mediastinum to the opposite side and interfered with the circulation through the vena cava, probably by modifying its course.

BENJAMIN, Montreal, Canada.

SPONTANEOUS PNEUMOTHORAX IN A PREMATURE INFANT WITH HEREDITARY SYPHILIS. J. MILHIT and E. ROYER DE VÉRICOURT, Bull. Soc. de pédiat. de Paris **32**:299 (May) 1934.

A girl, born prematurely at eight and a half months, was admitted to the hospital when 5 weeks old. The infant was miserable and had dyspnea and coughing but no fever. There was no leukocytosis. The tuberculin reaction was negative. There was pneumothorax on the left side, with displacement of the heart to the right. The infant coughed up some pus, which came from a pulmonary abscess. About a month after admission, just before she left the hospital, some fluid appeared in the left costophrenic angle. The pus which was coughed up did not contain any tubercle bacilli; some of it was injected into a guinea-pig, with negative results. No further observation of the course of the disease was made. No report of a Wassermann reaction of the blood is mentioned. The spleen was

enlarged, and the liver was normal. The grandfather died of dementia paralytica. The mother had given birth to two other premature infants before this one. It is considered probable that the infant had hereditary syphilis.

BENJAMIN, Montreal, Canada.

PULMONARY ABSCESS COMPLICATING SEPSIS. F. PONTIERI, Pediatria **43**:708 (June) 1935.

A pulmonary abscess occurring in the course of sepsis is reported in an infant 9 months of age. The scarcity of clinical and roentgenographic evidence is of particular interest. The histologic examination showed a large sclerotic zone circumscribing the abscess.

SIGNORELLI, New Orleans.

CLINICAL STATISTICAL STUDY OF 289 CASES OF CARDIOPATHY IN CHILDREN. W. SCHWARZ and F. TECILAZIC, Pediatria **43**:751 (July) 1935.

A review of 53,000 cases observed during the past ten years in pediatric clinics of Milan shows that 289 patients had a cardiac disorder. In 52 of these patients the condition was of congenital origin. At the present time 38 have died; 171 are known to be living, and 80 could not be traced. Of the living, 135 reported for periodic examination at their respective clinics.

These patients were studied clinically, roentgenologically and cardiographically. The problems of the etiology and the prognosis are discussed at length.

SIGNORELLI, New Orleans.

PRIMARY SARCOMA OF THE LUNGS IN INFANCY. N. CARRARA, Pediatria **43**:823 (July) 1935.

A case of primary sarcoma of the lung in a 9½ year old girl is reported, with a full discussion of the clinical, roentgenologic and anatomic histologic data. Photomicrographs add to the value of the presentation, and the author states that with the present-day facilities of roentgenology the ambiguous diagnosis of intrathoracic tumors should be supplanted by an accurate diagnosis, even to the point of determination of the type and site of the tumor.

SIGNORELLI, New Orleans.

CLINICAL ASPECT OF PULMONARY ABSCESS IN INFANCY AND ITS SURGICAL TREATMENT. ARESKY AMORIM, J. de pediat., Rio de Janeiro **2**:301 (July) 1935.

Although nontuberculous abscesses of the lung are rare in infancy, the author believes that they can be diagnosed by their appearance in roentgenograms in that they have the characteristic in infants of often opening into the pleural cavity. Four cases are reported, and both anterior-posterior and lateral views are shown. As to treatment, it is the custom of the author to wait four weeks to see whether the abscesses will not rupture spontaneously. If they do not do so, he prefers to use the pneumectomy method of Graham.

SANFORD, Chicago.

BRONCHOSCOPY IN UNDIAGNOSED SEVERE STENOSES. ERICH HÄSSLER, Monatschr. f. Kinderh. **61**:330, 1935.

This is a clinical report on five patients with bronchial obstruction of indefinite etiology. In all of these either direct laryngoscopy or bronchoscopy made the condition definitely worse by increasing the inflammatory reactions. Hässler believes that bronchoscopy is indicated in children only after the history or a roentgenogram suggests an aspirated foreign body.

GERSTLEY, Chicago.

PERSISTENT SPONTANEOUS PNEUMOTHORAX IN INFANTS. L. FOLKE, Acta pædiat. **17**:426, 1935.

Thanks to the increasing use of roentgenography, the occurrence of spontaneous pneumothorax in infants and in young children is being recognized with increasing frequency. Spontaneous pneumothorax can appear as a sequel of a recognized antecedent disease of the lungs; it can also occur without demonstrable cause. In the first case it is termed "symptomatic"; in the latter event it is designated as "idiopathic" or "simple." In infants symptomatic pneumothorax is a rare complication of tuberculosis; more commonly it results from pyogenic pneumonia or empyema. There is a dearth of exact anatomic information concerning the etiology of idiopathic or simple spontaneous pneumothorax in infants. The commonest observation at autopsy is the presence of a developmental anomaly of the lungs, usually a bronchial fistula, an air cyst or a subpleural bleb. Pneumothorax in infants produces scant physical signs; the diagnosis is usually made by means of the roentgen rays. The outcome is always uncertain. Some patients recover without medical aid; surgical intervention is occasionally successful. Tideström has reported the case of a patient in whom spontaneous pneumothorax occurred at 10 days of age and persisted for eight years.

The author reports the case of a boy, 3½ months old, who exhibited tachypnea immediately after a rather difficult delivery. The increased respiratory rate persisted for several months; dyspnea was present during crying and nursing. There were no definitely abnormal physical signs in the chest. The diagnosis of partial, right-sided pneumothorax was made by roentgen examination. The patient was followed up to the age of 17 months. At this time the roentgen rays showed no changes in the condition of the lungs. Although the physical signs had become more definite and the child's development was somewhat retarded, he appeared happy and mentally alert.

Twenty reports of idiopathic spontaneous pneumothorax in infants have appeared in print. The author analyzes these in a table and supplies a short bibliography.

McCUNE, New York.

DIFFERENTIAL DIAGNOSIS OF PNEUMONIA IN CHILDHOOD. S. AHNSJÖ, Acta pædiat. **17**:439, 1935.

The importance of displacement of the mediastinum and of the diaphragm in the diagnosis of pulmonary disease is well appreciated. However, it is usually taught that in acute pneumonia the heart shifts toward the affected side. This is generally explained on the basis of atelectatic collapse of portions of the involved lung, with emphysema of the uncompromised lung. This emphysema has the further effect of depressing the diaphragm on the side of the intact lung.

Ahnsjö describes a case of lobar pneumonia involving the entire left lung in a 14 month old child. Roentgenograms showed the mediastinum to be displaced toward the opposite side. Repeated exploratory punctures of the chest and, finally, operation failed to reveal more than a few cubic centimeters of fluid. At necropsy the entire left lung was found to be consolidated; its volume was appreciably increased. By virtue of this enlargement the heart was displaced contralaterally and the opposite lung was somewhat compressed. Pleural effusion was absent. There was an unimportant abscess in the lower lobe of the consolidated lung.

McCUNE, New York.

Diseases of the Gastro-Intestinal Tract, Liver and Peritoneum

THE TREATMENT OF ENTERITIS IN INFANTS AND CHILDREN WITH THE RAW APPLE DIET. JOHN GIBLIN and MOSES D. LISCHNER, Arch. Pediat. **52**:355 (June) 1935.

One hundred and thirty infants and children with enteritis, either enteral or parenteral, ranging from 1 month to 8 years of age, were treated with scraped

raw apple, with only one death—a mortality of 0.8 per cent. From one to four tablespoonfuls of grated ripe raw apple, including the skin, was given every two hours, day and night, for forty-eight hours. For those children who disliked apple, 1 inch (2.54 cm.) of mashed ripe banana was added to each tablespoonful of apple. Nothing else was given by mouth except water or weak tea in small amounts, and fluids were administered parenterally in order to maintain the proper water balance. Improvement appeared to be rather dramatic, the stools changing in character within from twenty-four to forty-eight hours, with prompt disappearance of mucus and blood.

The authors describe various theories advanced in support of the therapeutic value of apple.

WADDELL JR., University, Va.

THE TREATMENT OF DIARRHOEA IN INFANTS AND CHILDREN BY A DIET OF RAW APPLES. JOHN M. MITCHELL, M. Clin. North America **19**:301 (July) 1935.

The usual treatment of diarrhea in infants and young children by initial starvation and the administration of water and later by careful dietary management is efficacious in most cases of this disorder. There remain, however, some cases in which the disorder is protracted in which the patient does not recover satisfactorily under such treatment. These are especially the diarrheas which may be classed as parenteral, those associated with nondysenteric infections of the gastrointestinal tract and food poisoning. In these cases the raw apple diet is superior to any other mode of therapy in general use today, and its effect in a large proportion of cases is little short of dramatic.

EUGENE SMITH, Ogden, Utah.

OBSERVATION ON A RECENT EPIDEMIC OF DIARRHEA WITH BACTERIOLOGIC STUDIES. C. O. TERRELL and MAY OWEN, Texas State J. Med. **31**:204 (July) 1935.

The authors report an epidemic of diarrhea in Fort Worth, Texas, occurring during September, October and November 1934. Both adults and children were affected. The cases numbered in the thousands, and in many instances the condition was severe. Bacteriologic studies for the various organisms causing dysentery of the paratyphoid and colon groups, gave negative results in fourteen patients studied, but almost all showed a gram-positive diplococcus which differed from Bargen's diplococcus in that it fermented mannite. Thirty other patients studied showed the same organism. Cultures from twelve of these were injected intravenously into rabbits. When the rabbits were examined post mortem, eight showed changes in the mucosa of the colon, consisting of hemorrhage and hyperplasia of lymphoid tissue. The authors believe that this organism may be the etiologic agent in many of the diarrheas which are now attributed to the dysentery bacillus.

MOORE, Dallas, Texas.

A CASE OF COELIAC DISEASE SHOWING UNUSUAL FEATURES SUCCESSFULLY TREATED WITH INSULIN AND GLUCOSE. B. SCHLESINGER and K. D. KEELE, Arch. Dis. Childhood **10**:149 (June) 1935.

A boy, 7 years old, had clinically typical severe celiac disease, with rickets and symmetrical fractures. The analysis of the fat in the stools gave normal findings. The brunt of the disorder appeared to be bound up with a faulty carbohydrate metabolism. Marked clinical improvement was obtained with insulin and dextrose therapy. The bearing of this case and of similar cases reported in the literature on the etiology of the disease is discussed. A tentative suggestion is made that a significant part is played by a disordered endocrine system.

KELLY, Milwaukee.

ABDOMINAL PAIN IN CHILDREN. A. RENDLE SHORT, Brit. M. J. **1**:1157 (June 8) 1935.

Short divides the group of children with abdominal pain into those with diarrhea and those without diarrhea, those under 5 years of age and those over 5 years

of age. He does not discuss those with diarrhea. He states that in children under 5 years of age appendicitis is not impossible but is distinctly uncommon. Intussusception is next discussed, and the classic symptoms are outlined. He thinks that sometimes mucous colitis of sudden onset is diagnosed as appendicitis, and an unnecessary operation is performed. Attention is drawn to the possible mistake in confusing intussusception and Henoch's purpura. Strangulated hernia is also mentioned.

In children over 5 years of age he thinks that a great many conditions occur and that many are mistaken for appendicitis. However, he discusses genuine appendicitis and calls attention to the classic symptoms. He then lays special stress on pneumococcic peritonitis, which, he states, is almost entirely confined to girls of school age and which is often mistaken for appendicitis. Although this type of peritonitis sometimes follows pneumonia, it is more commonly a primary condition. He thinks that an operation rarely saves the child. There is a sharp differentiation between pneumococcic peritonitis and basal pneumonia simulating appendicitis. Influenza, he states, may often be accompanied by pain and tenderness in the lower right part of the abdomen, with fever. The most difficult of all conditions to diagnose is inflammation of the mesenteric glands in the angle between the terminal part of the ileum and the ascending colon. They may not be tuberculous, but in many instances they are. Tuberculous peritonitis is then discussed, as well as tuberculous spinal disease with abdominal pain. Mention is made of chronic muscular strain of the abdominal muscles, with more or less recurrent abdominal pain, which many children complain of. This disorder is usually difficult to diagnose, and the author thinks that it is largely caused by mesenteric lymphadenitis, usually tuberculous. This pain, he thinks, is due to the fact that the splanchnic nerve fibers of the mesentery actually traverse the lymphatic glands and occurs when a wave of peristalsis, which would otherwise not be noticed, pulls on the mensentery. This is the pain which a child complains of frequently as "my pain."

ROYSTER, University, Va.

HEPATOMEGALY IN AN INFANT. (HEPATOMEGALIA GLYCOGENICA? HYPERTROPHIC STEATOSIS?). R. W. B. ELLIS, Proc. Roy. Soc. Med. **28**:833 (May) 1935.

A 3 month old infant was admitted to the hospital on account of the enormous size of the abdomen. The child was shown at the meeting of the Section for the Study of Disease in Children, held on Oct. 27, 1933. The abdomen was distended with the smooth firm mass of the liver, the right lobe reaching to the pubis. The possibility that the condition might be due to a neuroblastoma of the adrenal metastasizing in the liver was discussed, and the suggestion was made that the condition was more probably an example of von Gierke's disease. Subsequent investigations partly confirmed the latter view.

For the past sixteen months the child has progressed normally, and decrease in the size of the liver has been striking. The right lobe is palpable as a firm mass in the right loin. The margin of the liver extends 2 fingerbreadths below the costal margin.

The report is accompanied by photographs of the patient and comment by the author.

WILLIAMSON, New Orleans.

PRIMARY CANCER OF THE LIVER IN A CHILD; PARTIAL HEPATECTOMY; OPERATIVE CURE. M. ARMAND-DELILLE, FÈVRE and LESTOCQUOY, Bull. Soc. de pédiat. de Paris **32**:292 (May) 1934.

A girl of 11 years was admitted to the hospital for sore throat of two days' duration. She was found to have an enlarged liver, which produced an elevation in the right hypochondrium that moved with respiration. She had been losing weight for no apparent reason for the past few months. At operation a large tumor of the liver was encountered; the liver was resected, along with the gallbladder, which was not involved. The edges of healthy hepatic tissue were sutured

together. Three and a half months after the operation the child appeared healthy. There was a tiny fistula at the site of the incision. Histologic examination of the growth removed at operation showed it to consist of two parts, one of hepatic tissue, with liver cells and portal spaces but with disordered architecture, and another of neoplastic tissue, the cells of which were homogeneous and tended to arrange themselves in trabeculae and nodules with some attempt at the formation of alveolar structure. The cells were of the epithelial type, with a large amount of cytoplasm; at times they took the eosin stain; the nucleus had a large nucleolus and a fairly dense chromatin network, and very large nuclei and mitotic figures occurred frequently. A richly cellular, abundant stroma was present between the epithelial elements. At numerous places the hepatic tissue could be seen next to the areas of neoplastic cells, but the latter did not invade the sinusoids; in other spots there was a definite barrier between the liver and the tumor tissues. It is believed that an operative cure of a primary epithelioma of the liver was obtained, but the prognosis as to the future course of the condition is reserved.

BENJAMIN, Montreal, Canada.

FUNCTIONAL PYLORODUODENAL STENOSIS IN AN INFANT. JEAN CATHALA and GOUYEN, Bull. Soc. de pédiat. de Paris **32**:678 (Dec.) 1934.

An emaciated girl of 3 months had begun to vomit when a few days old. The vomiting persisted; it was not projectile and occurred at intervals between feedings. The condition was not considered to be pyloric stenosis, and roentgenologic examination did not yield any evidence to support this diagnosis. After some slight improvement the infant continued to vomit, and a second roentgenologic examination was made, which showed marked gastric retention. Visible gastric peristaltic waves were observed, and it was believed that congenital pyloric stenosis was present, but the surgeon believed that there was some pyloric or subpyloric obstruction which was not necessarily of the simple hypertrophic type which might require more than the usual pylorotomy. It was decided to posture the child in the prone position after feedings, which might relieve the condition if it were purely functional. This was tried, with good results; the infant began to gain weight consistently, and no surgical intervention was necessary. The conclusion reached was that there was functional pyloroduodenal stenosis.

BENJAMIN, Montreal, Canada.

TREATMENT OF INTESTINAL AND URINARY INFECTIONS (PARTICULARLY OF THE COLON BACILLUS GROUP) WITH DI-BROMOXYMERCURIFLUORSCEIN OF MERCUROCHROME. C. DAVID, J. de méd. de Paris **55**:27 (Jan. 10) 1935.

David uses mercurochrome in doses of 15 cg. per day in all types of infectious diarrhea and in infections of the urinary tract due to the colon bacillus. He reports excellent results but gives no definite figures. Renal insufficiency is cited as the only contraindication to the use of this drug. LESLIE, Evanston, Ill.

TREATMENT OF INTUSSUSCEPTION IN THE INFANT. J. BOUYALA, J. de méd. de Paris **55**:327 (April 11) 1935.

The article is a review of the thesis on this subject by Emmanuel Pouliquen. The technic of giving a barium sulfate enema in an attempt to reduce the invagination is described. Three things may happen: 1. If the barium sulfate does not fill the depth of the cecum, the invagination has not been reduced. The bowel should be emptied by siphonage and the patient transported to the operating room. 2. If the barium sulfate fills the cecum fairly well but does not pass into the small intestine it is probable that the invagination has been reduced, but doubt remains, and an exploratory operation is advisable. 3. If the enema passes

into the small intestine it is certain that the invagination has been reduced, and operative intervention is not necessary. The surgical technic is also carefully described. A complete bibliography is given.

LESLIE, Evanston, Ill.

SYMPTOMATOLOGY OF EARLY PNEUMOCOCCIC PERITONITIS. G. PIOTET, J. de méd. de Paris **55**:416 (May 9) 1935.

During the course of operations for appendicitis Piotet encountered four cases in which sticky pus was found gluing together intestinal loops and in which the appendix was normal. Two such cases are reported in detail. In each a pneumococcus was cultured from the pus, and recovery occurred following the washing out of the peritoneal cavity with ether. Piotet believes that usually pneumococcic peritonitis may be differentiated from peritonitis following a ruptured appendix by: (1) the association of respiratory symptoms, (2) equal tenderness and distention of both sides of the abdomen, (3) marked diarrhea and (4) the general appearance of the child, who does not seem as sick as is usual following a ruptured appendix. Recovery may occur without surgical intervention. In all events, if the diagnosis is certain it is better to wait for the formation of pus before draining.

LESLIE, Evanston, Ill.

BLOOD PROCTOCLYSIS AS A THERAPEUTIC MEASURE IN MALNUTRITION. N. CARRARA, Pediatria **43**:686 (June) 1935.

Fifteen infants with malnutrition were treated by the administration of maternal blood by proctoclysis in conjunction with dietetic management. The results were uniformly good and led Carrara to recommend the procedure for all infants requiring activation of protoplasm. The author believes this method of the administration of blood to be superior to other forms of hemotherapy in dystrophic conditions because of its double, i. e., local and general, action.

SIGNORELLI, New Orleans.

INTESTINAL INFANTILISM. LUIZ MORQUIO, J. de pediat., Rio de Janeiro **2**:3 (Jan.) 1935.

Morquio reports two cases of intestinal infantilism of Herter. He thinks that this is a relatively rare condition, as it occurred in only two of 14,800 children under 12 years of age. Both children ultimately recovered after rather stormy experiences with digestive setbacks and intercurrent infections. The diet that seemed to be most efficacious was one of leguminous foods and bananas. The author is somewhat doubtful whether this condition represents a true specific clinical entity or whether it may be a symptom complex that may develop after long periods of dyspepsia.

SANFORD, Chicago.

UMBILICAL FISTULA. MARTÍNEZ VARGUS, Med. de los niños **36**:161 (June) 1935.

Two cases of peritoneal abscess resulting from the presence of Ascaris are described. In a boy, aged 7 years, with a history of several years of intestinal disturbances, an abscess of the intestinal and adherent structures discharged through the umbilicus. This necessitated removal of a section of the bowel and the application of a Murphy button. The button passed in four weeks, and two weeks later it was found that the peritoneal infection had extended into the left pleural cavity, necessitating resection of ribs.

In a boy, 4½ years of age, with a history of parasitism, vomiting and abdominal pain were followed by adhesive peritonitis involving the abdominal wall. When this was emptied, portions of macerated Ascaris lumbricoides were removed.

DWYER, Kansas City, Mo.

TREATMENT OF PYLOROSPASM WITH VASANO. SIEGFRIED LIEBE, Monatschr. f. Kinderh. **61**:365, 1935.

Liebe treated seventeen infants with pylorospasm with a proprietary medicine consisting of a combination of one part scopolamine to four parts hyoscyamine bound to camphoric acid. The dose is 1 mg. Pharmacologically, the drug acts like atropine. He reports favorable results.

GERSTLEY, Chicago.

INTESTINAL PARASITES. G. B. GRUBER, München. med. Wchnschr. **82**:733 (May 9) 1935.

Gruber defends his contention that trichinosis can be followed by the development of a neoplasm and that it is causally related to the new growth. He also reports that the migration of ascarides through the normal intestinal wall has been observed by other investigators and by himself. His observation was on a 3 year old boy who was operated on for peritonitis. Round-worms were found free in the peritoneal cavity as well as in the intestinal wall.

BRAHDY, Mount Vernon, N. Y.

CLINICAL ASPECTS AND THERAPY OF CHRONIC DIGESTIVE WEAKNESS DURING CHILDHOOD (HERTER-HEUBNER'S DISEASE). E. HOLZMANN, München. med. Wchnschr. **82**:864 (May 30) 1935.

Holzmann describes the clinical picture of celiac disease The absence of frequent stools does not exclude the diagnosis. The author believes that an important factor in the etiology is a constitutional inferiority. This is supported by the occurrence of the disease in siblings, an observation whch can be made only in families with many children. The dietary treatment described is the one in general use today.

BRAHDY, Mount Vernon, N. Y.

WEIL'S DISEASE IN ROTTERDAM. H. G. WOLFERT, Maandschr. v. kindergeneesk. **4**:459 (Aug.) 1935.

This is an extensive summary and discussion of two hundred and five cases of Weil's disease occurring in Rotterdam from 1925 to 1935. Of these cases, fifteen were in children younger than 13 years; all recovered. The older the patient, the greater is the mortality.

VAN CREVELD, Amsterdam, Netherlands.

FAMILIAL PYLORIC STENOSIS. T. HALBERTSMA, Maandschr. v. kindergeneesk. **5**:24 (Oct.) 1935.

The existence of a prolonged and narrowed pyloric canal has been established roentgenologically. The author uses this fact as a basis in trying to explain the occurrence of the clinical symptoms in pyloric stenosis. This condition is to be regarded as a congenital malformation which is hereditary and familial. This fact is illustrated by the reports in the literature and the author's observations in thirty-two cases.

VAN CREVELD, Amsterdam, Netherlands.

Nervous Diseases

FOCAL CALCIFICATION OF THE BRAIN AND DURA OF A HYDROCEPHALIC IDIOT CHILD. GEORGE RUKSTINAT, Arch. Path. **19**:47 (Jan.) 1935.

The literature concerning the occurrence of focal calcification in brain tissue is briefly reviewed, and a case occurring in a 3½ year old hydrocephalic idiot is reported. Cerebral birth trauma and endocrine dysfunction are suggested as etiologic factors predisposing to calcification. The suggestion is also made that internal hydrocephalus may have occurred as a result of venous stasis in the great vein of Galen, causing superabundant secretion of cerebrospinal fluid.

LEMASTER, Evanston, Ill.

FRIEDREICH'S ATAXIA IN TWINS; REPORT OF CASE. FRANCIS T. O'DONNELL and MARJORIE E. REED, Arch. Pediat. **52**:61 (Jan.) 1935.

Two cases of Friedreich's ataxia occurring in twins are reported. These cases are of particular interest because of the scarcity of reports of Friedreich's ataxia in identical twins, only three reports of a similar nature having been made since 1899.

WADDELL JR., University, Va.

EPILEPSY: ITS TREATMENT BY THE USE OF THE KETOGENIC DIET VERSUS DRUGS. LOUIS FISCHER, Arch. Pediat. **52**:131 (Feb.) 1935.

The article adds nothing to the information on the use of the ketogenic diet in the treatment of epilepsy.

WADDELL JR., University, Va.

DEMONSTRATION OF ENCEPHALIC CONTROL OF MICTURITION BY ELECTRICAL STIMULATION. ORTHELLO R. LANGWORTHY and LAWRENCE C. KOLB, Bull. Johns Hopkins Hosp. **56**:37 (Jan.) 1935.

Electrical stimulation of a portion of the premotor area of the cortex of the cat produces changes in bladder pressure. After a long period of latency the pressure increases, and micturition occurs. Stimulation of the same area causes the bladder pressure to decrease when it is already high. A small and poorly sustained increase occurs on excitation of the area from which contralateral movements of the hindleg can be elicited.

Stimulation of an area lateral to the posterior commissure or near the aqueduct of Sylvius in the midbrain produces elevation of bladder pressure and micturition. The paper furnishes further proof of control of tone in the urinary bladder by the midbrain.

AUTHORS' SUMMARY.

BLOOD VESSEL TUMOR OF THE SPINAL CORD IN A BOY AGED NINE YEARS. W. C. BLACK and H. K. FABER, J. A. M. A. **104**:1889 (May 25) 1935.

Only sixty-three cases of tumor of the blood vessels of the spinal cord have been reported. The authors report the case of an intradural venous tumor, probably hemangio-endothelioma, with associated varices in a boy of 9 years. They suggest that the combination noted of the Froin syndrome, a negative reaction to the Queckenstedt test which becomes positive after the withdrawal of spinal fluid below the lesion and a peculiar distribution of iodized poppy-seed oil in droplets may be pathognomonic of varices of the arachnoid and vascular tumor of the cord.

BONAR, Salt Lake City.

CORTICAL AUTONOMIC EPILEPSY. JAMES W. WATTS and CHARLES H. FRAZIER, J. Nerv. & Ment. Dis. **81**:168 (Feb.) 1935.

Visceral symptoms and signs occurring as an aura or independently of epilepsy have long been recognized. The two case histories presented here are of significance in that they illustrate that visceral phenomena may abort or replace a generalized convulsive seizure.

CASE 1.—A boy, aged 6 or 7 years, while playing in the yard, was frightened by twitching of the right thumb. This twitching occurred at intervals of several weeks, and gradually the hand and arm became involved in the convulsive seizure. Later, movements of the hand and face followed those of the arm, and the convulsion became associated with loss of consciousness, followed by headache. Eighteen years later severe periodic pounding headaches made their appearance and were accompanied by nausea. After an hour or so of "sick headache" there was vomiting or a convulsion. When vomiting occurred there was no convulsion, and the usual interval occurred before another attack made its appearance. At this time also weakness was noted in the right hand, leg and foot. A roentgenogram of

the skull revealed a calcified mass 2.5 by 3 cm. in the left temporoparietal region beneath the cortex. On operation this proved to be a cyst below the surface of the motor area of the cortex. It was removed, and the patient made a complete recovery.

CASE 2.—A boy, 4 years old, had a convulsion. It started with twitching of the left side of the face and spread to include the left upper extremity, which moved in a rhythmic rotary manner. The other extremities trembled but did not undergo clonic movements. The patient fell to the floor, vomited a few minutes later and complained of headache. This convulsion was similar to those which succeeded it during about a year. During the next four years the boy had no convulsions but suffered from periodic attacks of nausea, epigastric distress and vomiting. The nausea had no relation to meals. Two months before admission to the hospital the patient, then aged 8, had a typical convulsive seizure resembling the first attack four years before. Physical, neurologic and roentgenographic findings were normal. An encephalogram showed enlargement of the posterior horn of the right lateral ventricle and absence of cortical pathways in the left cerebral hemisphere.

The authors conclude from a study of these two cases and from an analysis of the literature on the subject that "epigastric aura and other visceral sensations described by (epileptic) patients are not so-called referred pains but are the result of vigorous and, perhaps, abnormal movements of the gastro-intestinal tract" (cortical stimulation).

JAHR, Omaha.

SYMPTOMATIC EPILEPSY IN ONE OF IDENTICAL TWINS: STUDY OF THE EPILEPTIC CHARACTER. WALTER FREEMAN, J. Neurol. & Psychopath. **15**:210 (Jan.) 1935.

The development of epileptic seizures implies the presence in the constitutional make-up of the patient of an X-factor, or the so-called epileptic psyche. This is true even in cases in which epileptic seizures develop only after cerebral injury.

This paper describes the history of identical girl twins, one of whom suffered from attacks of petit mal after convulsive seizures in infancy. A detailed character analysis of the two women, now aged 25, is submitted. Egocentricity, religiosity and all the other concomitant phenomena are outstanding features in each case. The only marked difference is that one twin suffered a cerebral injury early in life while the other escaped.

JAHR, Omaha.

A CASE OF JUVENILE AMAUROTIC FAMILY IDIOCY. R. M. NORMAN, J. Neurol. & Psychopath. **15**:219 (Jan.) 1935.

A girl, 14 years of age, was admitted to the Stoke Park Colony with partial blindness of both eyes (atrophic optic disks) and slight peripheral pigmentary change. She was helpless and had to be washed and dressed. Speech was monotonous and indistinct. The mental age was 6 years. Physical measurements showed general reduction from normality. The muscular power was extremely poor. The Wassermann reaction was negative. Several months later epileptic seizures developed. For the next two years there was progressive mental and physical deterioration, and the patient died of bronchopneumonia.

The patient was illegitimate. The mother was mentally retarded but subsequently married and now has seven normal children.

Postmortem examination showed extensive deposits of fat in and around the heart and the liver. The spleen was of normal size but was friable; the uterus was infantile, and the thyroid gland was very small.

The whole brain seemed firmer to the touch than is usual for fresh specimens. Atrophy of the cerebral convolutions was most marked in the frontal lobes, and widening of the sulci was marked in both hemispheres.

Microscopic examination of the cortical areas revealed the familiar cell structure characteristic of imbecility (a poor layer of pyramidal cells and inadequacy of the granular cells). Neuronal changes were typical of those associated with

amaurotic family idiocy (pear-shaped swelling of the cytoplasm). Some of the Betz cells showed little swelling; the lipoid aggregations were small and resembled deposits of lipochrome observed in senile brains.

There is a comprehensive discussion on the nature of the disease with adequate description and illustration of microscopic sections. JAHR, Omaha.

THE RÔLE OF THE CEREBRAL CORTEX IN NARCOLEPSY: THE CLASSIFICATION OF NARCOLEPSY AND ALLIED DISORDERS. MAX LEVIN, J. Neurol. & Psychopath. **15**:236 (Jan.) 1935.

It seems probable that the sleep center helps to regulate the depth, frequency and duration of sleep. The cause of sleep, the author contends, lies in fatigue incident to the manifestation by cortical activity of an adaptation for the inhibition of overactivity, to the end that normal irritability may be restored.

Cases of morbid somnolence may be divided into the following types: Group 1 consists of cases of generalized sleep in which the sleep center or the cortex or both may be at fault. Etiologically, the condition may be idiopathic or symptomatic. Group 2 includes the cases in which there may be (*a*) sleep paralysis, predormital or postdormital; (*b*) cataplexy (attacks of powerlessness with unimpaired consciousness, precipitated by laughing or other emotions); (*c*) attacks of powerlessness occurring without antecedent emotion, and (*d*) increased motor activity during sleep. In the latter group it is logical to believe that part or parts of the cerebral cortex are, for some reason, unduly subject to inhibition.

JAHR, Omaha.

MIXED TUMORS OF THE BRAIN. HAROLD E. HARDING and A. E. NAISH, Lancet **1**:77 (Jan. 12) 1935.

Descriptions are given of a teratoid tumor of the hypothalamic region of a girl of 9 years and of a teratoma of the fourth ventricle of a girl 1 year old. In the first case peculiar symptoms characteristic of involvement of the hypothalamic region are described. LANGMANN, New York.

OBSERVATIONS ON THE GUANIDINE, GLUCOSE AND CALCIUM CONTENT IN THE BLOOD IN ECLAMPSIA. V. I. KRIEGER, M. J. Australia **2**:746 (Dec. 8) 1934.

Krieger reports on a study of the guanidine content of the blood in thirty cases of eclampsia in correlation with the dextrose and calcium concentrations. No appreciable increase in the amount of guanidine was observed, the average concentration being 0.38 mg. per hundred cubic centimeters of blood. In 33 per cent of the specimens of blood examined the value for blood sugar was below 0.8 per cent, although only isolated estimations, without reference to the phase of eclamptic seizure, were made. This indicates the probability that hypoglycemia existed at some phase in relation to the convulsions.

In 68 per cent of the cases of eclampsia the calcium content of the blood was below 10 mg., and in 39 per cent the value was less than 9 mg. per hundred cubic centimeters of blood.

These findings are not in agreement with those of Minot and Cutler, who reported that eclampsia was characterized by a high guanidine content associated with low dextrose and calcium concentrations of the blood.

GONCE, Madison, Wis.

LATE RESULTS OF OPERATION FOR TUMOR OF THE BRAIN IN CHILDREN. CLOVIS VINCENT, F. RAPPOPORT and J. ROUDINESCO, Bull. Soc. de pédiat. de Paris **32**:263 (May) 1934.

Tumor of the brain is not uncommon in children. The majority are observed in the posterior fossa, although some occur in the anterior fossa. The most

common in the first few years of life is medulloblastoma, whereas after the age of 5 years astrocytoma is more common. Ependymoma is a rarer tumor in children, and hemangioma is very rare, the authors having encountered only one instance. Medulloblastoma is malignant, and at operation one removes as much as possible of the growth so as to produce decompression. Then roentgen therapy is administered, as this has a favorable destructive action on tumor cells of this type. The operative mortality in the authors' series was 25 per cent, and the patients who survived the operation did not live longer than six months after operation. Ependymoma is a benign growth but usually occurs in the floor of the fourth ventricle, where it is difficult to deal with. The child is usually born with a large head, and hydrocephalus develops early. The tumor begins to cause trouble when the development of the head can no longer keep pace with the size of the tumor and of the hydrocephalus. All but the base of the tumor, which is implanted in the fourth ventricle, is removed. The operation is grave because from about four to twelve hours later the respiratory rate usually increases from 24 to 40 per minute, difficulty in swallowing follows, signs of pulmonary edema are present, with frothing at the mouth, and the child dies. Examination of the operative wound at necropsy shows nothing abnormal. In one case Ringer's solution was injected into one of the lateral ventricles, and the development of this accident was stopped. Astrocytoma takes a long time to develop and is relatively benign: In a man who underwent unsuccessfully operation for this type of cerebellar growth, Broca had evacuated a cerebellar cyst twenty-seven years before, and the man had been cured of his symptoms. It required this time for the growth on the cyst wall to become large enough to produce recurrence of symptoms. The mortality in cases of tumor of this type was 15 per cent. Eleven living patients were presented, with brief summaries of their case histories, demonstrating the enormous strides which have been made in the field of neurosurgery in the last few decades.

BENJAMIN, Montreal, Canada.

PYRAMIDOCEREBELLAR SYNDROME IN A CASE OF HEREDITARY SYPHILIS. L. BABONNEIX and P. GUILLY, Bull. Soc. de pédiat. de Paris **32**:284 (May) 1934.

A girl, 4½ years old, had had difficulty in walking since the age of 18 months, when she first began to walk. She presented the usual spasticity seen in cases of cerebral diplegia, but there were also marked signs of cerebellar involvement, such as intention tremor, past pointing, adiadokokinesis, horizontal nystagmus and scanning speech. The teeth were in poor condition, and there were marked caries and discoloration. The Wassermann reactions of the blood of both parents were negative. No mention is made of any serologic test of the child's serum. The patient was given antisyphilitic treatment, without any improvement of the trouble.

BENJAMIN, Montreal, Canada.

TRANSIENT STRABISMUS PRODUCED BY FLEXION OF THE HEAD IN CASES OF ACUTE MENINGITIS IN INFANTS. ROBERT DEBRÉ, JULIEN MARIE and MESSIMY, Bull. Soc. de pédiat. de Paris **32**:316 (May) 1934.

A boy, 5 months old, was admitted to the Jules Simon Hospital, suffering from meningococcic meningitis. It was observed that when the neck was flexed, the rigidity being overcome, there was convergent strabismus of the eyes, which disappeared when the head was replaced on the pillow. This was present for a number of days and disappeared entirely as soon as the infant recovered. He was discharged from the hospital as cured but returned shortly afterward with bronchopneumonia, which proved fatal. At necropsy the central nervous system showed no abnormality. A second boy, 4 months old, was observed during the course of meningococcic meningitis. He had little stiffness of the neck but showed definite divergent strabismus, more marked in the right eye, when the head was bent forward so that the chin touched the sternum. The child died on the ninth day, and at necropsy all the ventricular system was observed to be dilated and to con-

tain pus. The alteration of the intracranial pressure, when this is increased, by bending the head forward may so affect the nuclei of origin or the fibers of the ocular nerves as to produce intermittent strabismus, the pathogenesis of which is probably functional.

BENJAMIN, Montreal, Canada.

PNEUMOCOCCIC MENINGITIS IN INFANCY. C. VIGLIETTA, Pediatria **43**:800 (July) 1935.

Forty-six cases of pneumococcic meningitis occurring in the pediatric clinic of Palermo, Sicily, from 1921 to 1934 are reported. The author discusses at length the frequency of occurrence, clinical signs and symptoms, diagnosis, therapy and prognosis of the disease. He makes the following conclusions: Pneumococcic meningitis is met even as a primary disease of endemic type; of all purulent forms of meningitis the pneumococcic type represented a total of 80 per cent of the cases seen in Palermo during the period from 1921 to 1934; this type most frequently attacked young infants; a diagnosis cannot, of course, be made conclusively without bacteriologic examination of the spinal fluid; though the most frequent location of the lesion is the vault, it is often observed to be basal; the prognosis was unfavorable, with a mortality of 54.3 per cent and failure to effect a cure in 98 per cent of the cases, and the various curative means employed cannot be considered to have any efficacy.

In only one case did the disease go on to complete cure without residual pathologic lesions; this patient was treated with lumbar puncture in conjunction with intramuscular administration of vaccines. These same procedures were utilized in the other cases but proved to be completely ineffective.

SIGNORELLI, New Orleans.

A CASE OF FACIAL PARALYSIS. JERONI MORAGAS, But. Soc. catalana de pediat. **6**:92 (March-April) 1933.

Paralysis of the left facial nerve occurred fifteen days after a febrile exanthematous condition. Examination of the spinal fluid revealed a slightly positive Nonne-Apelt reaction, an albumin content of 0.25 Gm. per thousand cubic centimeters and slight central elevation of the Lange (colloidal gold) curve. The fluid was normal in all other respects. After treatment with electrical stimulation and arsphenamine, there was marked improvement. The author thinks that the cause was either a virus or intoxication.

WATSON, Elmhurst, Ill.

TORSION DYSTONIA IN CHILDHOOD. ERNST ASCHER, Jahrb. f. Kinderh. **144**:127 (March) 1935.

The author reports a case of torsion dystonia in a 7½ year old boy, whose first symptoms appeared shortly after tonsillectomy. The literature is reviewed. The differential diagnosis of hysteria, Wilson's disease, Huntington's chorea and athetosis, in addition to the various forms of myotonia and the postencephalitic form of Parkinson's disease, is discussed.

The sensitivity of the corpus striatum, especially during puberty or prepuberty, to injury, such as that due to poisons, or the possibility of hemorrhage due to slight injuries or contusions is considered and discussed. Pathologically, no two cases are alike. The extrapyramidal system is the seat of the lesions, which corresponds with what one usually finds clinically.

LANDAU, Rochester, N. Y.

IS THERE A RELATION BETWEEN WEATHER AND MANIFEST TETANY? STURE A. SIWE, Monatschr. f. Kinderh. **63**:113, 1935.

In a study of the influence of meteorologic conditions on the development of tetany, the author investigated the effects of the amount of sunshine during the

preceding summer, the barometric pressure during the preceding periods and the temperature of the preceding summer and autumn. He concludes that tetany is not influenced by any of these factors.

GERSTLEY, Chicago.

PNEUMOCOCCIC MENINGITIS IN CHILDHOOD. P. BODE, Monatschr. f. Kinderh. **63**:165, 1935.

The case is reported of a 3 year old child who suffered from subacute meningococcic meningitis for eighty days. Temperature curves are shown. The outstanding features in this case were that it ended in recovery and that there was no known source of infection. Presumably the primary focus lay in the nasopharynx. Blood cultures revealed the pneumococcus, and the spinal fluid showed varying pictures of cloudiness, with the presence of pneumococci, and clearness, with the absence of pneumococci.

GERSTLEY, Chicago.

THREE CASES OF SPASMOPHILIA IN WHICH CONVALESCENCE WAS ATYPICAL. B. SÖDERLING, J. WALLIN and W. WERNSTEDT, Acta pædiat. **17**:543, 1935.

It is axiomatic that tetany in infants is characterized by diminished concentration of calcium in the blood serum and by increased excitability of the nerves to electrical stimuli. In general, the degree of such alterations parallels the severity of the manifestations of the disease; however, there is increasing evidence to show that this relation is not invariable. Woringer, Griffith and Af Klercker have reported cases of infantile tetany in which the concentration of calcium in the blood serum was not reduced below the normal value. Drucker has obtained similar findings experimentally in animals. Wernstedt admits that a small percentage of infants with tetany fail to manifest increased excitability of the nerves to electrical stimuli.

A surprising lack of definite information exists concerning the duration of the various manifestations of tetany. Ordinary clinical experience leads one to expect a rapid disappearance of symptoms after the institution of specific therapy; this is followed by return of the serum calcium content to normal, and, finally, the exaggerated electrical excitability of the nerves falls to physiologic values, usually within two or three weeks.

The author reports three cases of infantile tetany in patients 1 year, 8 months and 3 months old, respectively. The diagnosis was substantiated by clinical findings, determination of the serum calcium content and electrical reactions. The progress of the disease was followed carefully, and detailed attention was paid to these three aspects. Although the overt manifestations of tetany, the low concentration of calcium in the blood serum and the rickets, which the infants presented, were all rapidly benefited by suitable therapy, increased galvanic excitability persisted for six, seven and nine weeks, respectively. In one case the value for the cathodal opening contraction remained less than 5 milliamperes, and a definite Chvostek sign persisted, despite the presence of a normal concentration of calcium in the blood serum. The electrical excitability of the nerves not only was slow in returning to normal but became more marked during the beginning of treatment.

The incongruities presented in these cases could not be explained satisfactorily. Attention is drawn to the fact that they were all encountered simultaneously during February. This coincidence suggested the possible importance of meteorologic factors.

MCCUNE, New York.

Psychology and Psychiatry

RETARDED SPEECH DEVELOPMENT. JOHN A. GLASSBURY, Arch. Pediat. **52**:425 (July) 1935.

The normal mechanism of speech development is described, and thirteen cases of retarded speech are cited. The causes of retarded speech are central and

peripheral. The various types of defect in speech occurring in mentally defective persons are described, as well as the reasons for persistent baby talk.

Treatment is discussed briefly under the following headings: (1) medical, (2) surgical and (3) educational. WADDELL JR., University, Va.

THE MENTAL ABILITY OF DELINQUENT BOYS. HOWARD A. LANE and PAUL A. WITTY, J. Juvenile Research **19**:1 (Jan.) 1935.

The results of a mental test of seven hundred delinquent boys in the St. Charles, Ill., School for Boys were analyzed. The authors believe that their search for factors associated with the intelligence of delinquent persons has been unsuccessful. No single item seems significant. But the falsity of many assertions as to the relation of the intelligence quotient to delinquency is obvious. A bibliography of twenty-nine references is included. HAMILL, Chicago.

THE BASAL METABOLISM OF TWENTY-ONE "PROBLEM BOYS." ARTHUR T. ORNER, J. Juvenile Research **19**:13 (Jan.) 1935.

Nothing of definitive significance was found in the careful determination of the basal metabolic rate of twenty-one problem boys; in 10 per cent of the cases the rate was 111 or above; in 61 per cent, between 90 and 110, and in 29 per cent, below 89. HAMILL, Chicago.

THE CONSTRUCTIVE ABILITY OF 150 SUBNORMAL CHILDREN. EDNA WILLIS MCELWEE, J. Juvenile Research **19**:25 (Jan.) 1935.

There are no striking divergencies between the intelligence quotient and the mechanical ability in these children. Mechanical ability increases between the ages of 10 and 14 and shows a slight decrease at the age of 14.

HAMILL, Chicago.

VOCATIONAL EXPERIENCE AND INTERESTS OF DELINQUENT BOYS. GEORGE E. HILL, J. Juvenile Research **19**:27 (Jan.) 1935.

Fifteen hundred men in the Illinois State Reformatory, aged from 16 to 26, were studied. Vocational guidance was almost completely lacking. Poor pay and forces believed by the worker to be beyond his control were the usual reasons given for unemployment. Nearly three fourths of the men were unemployed when they committed the offense that sent them to the reformatory. There was no vocational interest in the job to hold the worker. HAMILL, Chicago.

A STUDY OF RUNAWAYS AT A STATE CORRECTIONAL SCHOOL FOR BOYS. CORNELIA R. KEOGH, J. Juvenile Research **19**:45 (April) 1935.

The percentage of boys who run away is greater among those of normal intelligence than among the feebleminded. More boys run away at the age of 14 than at any other. This agrees with the idea that puberty is the age of conflict and that running away is a method of solution. HAMILL, Chicago.

A SURVEY OF THE EXTENT AND NATURE OF OFFENSES COMMITTED BY DELINQUENT BOYS. MERVIN A. DUREA, J. Juvenile Research **19**:62 (April) 1935.

In the study of the types of offenses committed by three hundred and sixty-eight boys in a boys' industrial school, 59 per cent of the offenses were found to be against property; 38 per cent violated social demands and decency, and 3 per cent were against persons. Recidivism, as denoting manifold offenses, is the rule, only 2.4 per cent of the boys being single offenders. HAMILL, Chicago.

EMOTIONAL IMBALANCE IN CHILDREN: THE CALCIUM AND INORGANIC PHOSPHORUS BLOOD SERUM DETERMINATION. CHARLES G. KERLEY, EDWARD J. LORENZE JR. and E. R. GODFREY, New York State J. Med. **35**:571 (June 1) 1935.

Ninety cases were studied in which the child showed lack of emotional control. Eighty-five per cent of the patients were from families of one or two children. The calcium and phosphorus contents of the blood were estimated. The nervous manifestations differed in no way in the few cases in which the calcium and phosphorus contents were found to be slightly below the normal. "In all, the imbalance proved to be emotional in nature, to be accounted for by domestic discord, unfavorable family contacts, unfair demands, unwise indulgence, unsuitable entertainment and in many cases too much wealth." There were sixty-one boys in the group and only twenty-nine girls, the preponderance being accounted for by the greater demands placed on boys, particularly in well-to-do families.

AIKMAN, Rochester, N. Y.

CONGENITAL SYNDROME CHARACTERIZED BY BILATERAL FACIAL PARALYSIS, BILATERAL PARALYSIS OF THE SIXTH OCULAR NERVE AND BILATERAL CLUBFOOT. JACQUES DECOURT and P. PERREAU, Arch de méd. d. enf. **38**:419 (July) 1935.

This curious association of congenital deformities has already been referred to in a report of four cases by French authors. The remarkable identity of the syndrome in different families was so striking a feature of this clinical review that the authors believed that the syndrome could be classed as a distinct entity.

An additional case, precisely similar in all respects, is added to the literature in the present contribution. It concerns a girl of 9 years, with a normal family history, who was born at term with the imperfections already noted. At the time of examination the orthopedic defects had been corrected, and attention was particularly attracted to the bilateral facial paralysis, which gave the child a blank, expressionless, immobile countenance. There were failure of occlusion of the eyelids and marked convergent strabismus, but the other cranial nerves were unaffected. Intelligence was rated as very high. The Wassermann reactions of the blood and spinal fluid were negative. The authors attribute the last-mentioned developmental errors to aplasia of the motor nuclei, but they can find no explanation for the coincident clubfoot.

AMESSE, Denver.

CASE OF THE KORSAKOFF PSYCHOSIS IN A CHILD. A. GARCISO, J. E. VIVIANO and A. CERDEIRO, Rev. méd. latino-am. **20**:411 (Jan.) 1935.

The characteristic symptoms of polyneuritis appeared in a boy of 7 years. Besides these he showed alteration of character, disturbance of sleep, terrifying hallucinations of sense and disturbances in memory, so that the previous diagnosis was changed. The history showed that for several months the boy had been drinking a glass of beer daily and an allowance of liquor. Appropriate treatment brought about a cure.

VINTON, New York.

THE PROBLEM CHILD AS A BIOLOGIC PROBLEM. STEPHAN EDERER, Jahrb. f. Kinderh. **144**:11 (Jan.) 1935.

Experiences with neuroses in adults cannot be projected into childhood, or vice versa. The development of the child (psychic development) is conditional on two groups of forces, the hereditary and the environmental. No factor which is biologically primary for the environment can modify only that which is inherited; on the other hand, the inherited characteristics can manifest themselves only in an adequate medium.

Constitutional basic characteristics that are measurable by psychophysiologic methods are mentioned and discussed.

The principal environmental factors include social and economic conditions, the sex, the family group and training.

Faulty methods of training are mentioned as a cause of difficulties in training.

Training consists of the building and releasing of positive reactions. The negative reactions are necessary to the building of restraint. Natural negative reactions are protective against painful or dangerous stimuli. Reasons against the use of physical punishment in training of the children include the following: (1) When the punishment cannot be carried out immediately it may lead to the building of negative conditioned reactions; (2) punishment cannot be carried out objectively when it depends on the subjectivity of the teacher; (3) great excitement delays the building of conditioned reflexes; (4) punishment lowers the self-confidence of the child; (5) the frightening effect of physical punishment isolates the child from the teacher, and (6) physical punishment can lead to a continuous condition of fear.

Reference is made to the development of pathologic symptoms, as mentioned by Benjamin. Persistence of infantile disturbances, such as nail-biting, finger-sucking, enuresis, etc., in a later age period means regression to an earlier period. Until the twelfth year symptoms of boldness and rage dominate. After the seventeenth year symptoms of introversion appear. From the twelfth year on different psychogenic disturbances appear in the foreground, such as fainting, tics and paresthesias. These occur much less frequently in girls than in boys.

The statement is made that the study of psychopathologic disturbances in childhood can be built up only by systematic and objective observation of the development of children.

LANDAU, Rochester, N. Y.

DRAWINGS AS INDICATION OF MENTAL DEVELOPMENT. JEAN WINTSCH, Ztschr. f. Kinderpsychiat. **2**:33 (June) 1935.

While the prevailing intelligence tests may be considered practicable indexes of mental development, comparatively few are designed to test the inherent observational as well as the creative capacity of the child. With this idea in view, the author, following the work of previous investigators along this line, presents the results of a study of "pictures" drawn by children of various chronological and mental ages and discusses the details of completeness of the drawings analyzed. Generally it is seen that details of these drawings vary with the mental rather than the chronological age of the child, certain norms, of course, being taken in consideration. The paper is written in French and is well illustrated.

JAHR, Omaha.

PSYCHOPATHOLOGIC AND CRIMINOLOGIC STUDY OF CHILDREN WITH CONDUCT DISORDERS. M. SCHACHTER, Ztschr. f. Kinderpsychiat. **2**:48 (June) 1935.

A sociologic and philosophic study is made of child behavior, child criminology, parental attitudes, court proceedings, etc. These problems are discussed brilliantly, but the paper does not lend itself to abstracting.

JAHR, Omaha.

DRAWING AS EVIDENCE OF MENTAL DEVELOPMENT. JEAN WINTSCH, Ztschr. f. Kinderpsychiat. **2**:69 (Aug.) 1935.

This paper is a continuation of the one which appeared in a previous issue. Further discussion and illustrations are submitted as evidence that picture detail varies with the mental age of the child. Drawing as a means of testing the mental development offers additional advantages to the tester. It takes into account native powers of observation and interpretation rather than scholastic training, which some children may have missed for one reason or another.

JAHR, Omaha.

EXPRESSION OR MOTION IN CREATIVE ART? W. ELIASBERG, Ztschr. f. Kinderpsychiat. **2**:83 (Aug.) 1935.

Two drawings are reproduced from a large collection of similar productions by an 11 year old boy who suffers from jacksonian epilepsy. The boy has from thirty to fifty seizures a day and, while conscious, pays little attention to scholastic work. He sits almost constantly at the window with paper and pencil, and it is only prior to an attack (during the aura) that one sees the pencil move on the paper, with resulting drawings of what the child sees or imagines. The article includes a theoretical discourse on creative art and artists with *Bewusstseinveränderungen*.

JAHR, Omaha.

MANIC-DEPRESSIVE PSYCHOSES AND SIMILAR SYNDROMES IN CHILDREN. A. WINOKUROWA, Sovet. nevropat., psikhiat. i psikhogig. **4**:119 (Feb.) 1935.

Manic-depressive insanity in children shows a predisposition to atypical forms, especially characteristic in young children. An unwonted clinical picture is exhibited—motor excitation instead of restraint and attacks of grief instead of depression. Frequently there is a terrified outbreak of the psychosis, due to toxic and infectious influences or psychic shock. The authors believe that transmitted endogenous features lie at the root of manic-depressive insanity, and they consider it possible that these changes can be acquired and that a definite heredity is not necessary for the production of manic-depressive insanity. Depressive states occur with great frequency in children, much oftener than in adults.

VINTON, New York.

PREVENTION OF DREAD OF BEING ANESTHETIZED. NILS H. YGBERG, Svenska läk.-tidning. **32**:708 (May 10) 1935.

A common cause of children's dread and distrust of the physician is a previous anesthetic given in a brutal way. In order to avoid nervousness and dread of the anesthetic children ought to be prepared before the anesthetization by a dose of a sedative administered by means of a suppository. The child should not be tied up on the operating table, and instead of a mask a dry, softly folded compress should be used. If possible, one of the child's parents should be present at the beginning of the anesthetization, and the child should be entertained and talked to. Each child should be treated individually. Painful and unpleasant measures should be avoided until unconsciousness is attained and should be over before the child regains consciousness. Children who are very nervous should be anesthetized before being brought to the operating room, preferably while sitting on the mother's knee. The use of tri-bromethanol is convenient for children in operations of longer duration.

WALLGREN, Gothenburg, Sweden.

Diseases of the Genito-Urinary Tract

DIFFERENTIAL DIAGNOSIS OF BRIGHT'S DISEASE. JAMES A. BRADLEY, J. South Carolina M. A. **31**:151 (Aug.) 1935.

In the diagnosis of Bright's disease a pathologic differentiation is preferred to the clinical. The author states the following conclusions:

"1. Hematuria and moderate hypertension indicate a glomerular damage.

"2. Marked hypertension with no red blood cells and only a small amount of albumin indicates renal arteriole damage.

"3. Marked albuminuria and marked edema without hypertension indicate tubular damage."

WESTON JR., Columbia, S. C.

OVARIAN CYST WITH TWISTED PEDICLE IN GIRL OF NINE YEARS OF AGE. CHARLES J. KICKHAM, New England J. Med. **212**:665 (April 11) 1935.

For the past several months the patient had lost considerable weight and complained of general debility. For five days before admission she had severe intermittent pain in the abdomen, with vomiting. There had been no bowel movement for five days. Her mother noticed swelling in the lower part of the abdomen. A physician referred the patient to the hospital with a diagnosis of intestinal obstruction.

A palpable mass was present on the right, close to the midline, extending from the pubes to a point 1 fingerbreadth below the umbilicus and felt doughy. Rectal examination showed a tender mass apparently contiguous with the mass felt through the abdomen.

At operation a large rounded cystic mass about the size of a grapefruit, with mottled and hemorrhagic walls, was delivered out of the pelvis and found to be a large ovarian dermoid cyst with three complete twists in the pedicle.

The patient was discharged on the thirteenth day in good condition.

GENGENBACH, Denver.

TORSION OF THE SPERMATIC CORD IN INFANCY. G. F. LANGLEY, Lancet **2**:181 (July 27) 1935.

The report of a case of torsion of the spermatic cord in a 17 week old infant, with complete recovery following orchidectomy, forms the basis of this article. In most cases of this nature the condition is diagnosed as strangulated hernia, but the degree of shock and the intensity of the gastro-intestinal symptoms are less in torsion, and there is never absolute constipation. Scudder considers that when the condition is doubtful the absence of the testicle from the scrotum, combined with an empty external abdominal ring, should lead to a diagnosis of torsion rather than strangulation. Donovan found that in infants torsion of the cord may be apparently symptomless. In cases of scrotal testis, acute epididymo-orchitis has to be ruled out.

Detorsion should always be attempted unless there is obvious necrosis. Donovan holds that orchidectomy is necessary in all cases after torsion of thirty hours.

LANGMANN, New York.

CHRONIC HYPERTENSIVE NEPHRITIS WITH HYPOTROPHY, MIGRAINE, ABDOMINAL CRISES AND TERMINAL ECLAMPSIA IN A GIRL OF EIGHT AND A HALF YEARS. LUCIEN GAROT, Arch. de méd. d. enf. **38**:91 (Feb.) 1935.

The history in this case includes the report of an attack of diphtheria when the child was 4 years of age. Although her physical development had been moderately retarded before this infection, it became markedly so afterward; her appetite failed, and she began to have violent seizures of migraine that recurred at intervals of from eight to fifteen days, with bilious vomiting. Several weeks later, crises of abdominal pain, often nocturnal, varying in duration, appeared and continued at irregular intervals, until the patient was examined by Garot more than four years afterward. During this time the child was able to attend school and to take part in the games of the playground.

Clinical survey at this time showed the patient to be poorly developed, badly nourished and in many respects presenting the picture of renal dwarfism, as there was a chronic lesion of the kidneys, with albuminuria and hypertension (the systolic pressure was 210 mm. and the diastolic pressure 150 mm.). There was, however, no evidence of rickets. Cultures from the nose were positive for diphtheria, which the author believes to be especially significant in searching for the etiologic factor. Two weeks after the initial examination, generalized convulsions developed, with right hemiplegia, and the girl expired within twenty-four hours.

AMESSE, Denver.

CONGENITAL BILATERAL HYDRONEPHROSIS. P. MARMONTEIL and SCHREIBER, Bull. et mém. Soc. d. chirurgiens de Paris **27**:135 (March 1) 1935.

For several months a child, aged 3 years, had suffered from attacks of pain, accompanied by swelling in the left hypochondrium. A hard mass was palpated in the lumbar region, which lay partly under the ribs and extended downward to the umbilicus, moving with the respirations. There were no abnormal findings in the urine, and hematuria, pyuria and pollakiuria were absent. Roentgenography after a barium sulfate meal showed no abnormality of the digestive tract. The diagnosis of sarcoma of the kidney was made, with a possibility of hydronephrosis.

Three operations were performed: at the age of 3, left nephrotomy for removal of renal sarcoma; at the age of 6, pyelostomy for the relief of attacks of retention and complete anuria, following rupture of the renal pelvis, and six months later, ureterocystoneostomy for the reestablishment of regular urination for retraction of the ureter prevented micturition by the normal channel.

VINTON, New York.

LIPOID NEPHROSIS AND HELMINTHIASIS. G. MARCHAL, P. SOULIÉ and A. GRIGAUT, J. de méd. de Paris **55**:140 (Feb. 14) 1935.

A women, 43 years old, had edema and massive quantities of albumin in the urine. Her nutrition became poor. Examination of the blood four months after the onset showed a low albumin-globulin ratio and an increased cholesterol content. She had noticed an ascaris in the stools several days before this, and examination of the stools for the parasites showed ova of Trichocephalus trichiura. After administration of a vermifuge containing oil of chenopodium the symptoms disappeared; the urine became free from albumin, and the blood albumin and globulin were restored to normal. The possible relationship between helminthiasis and lipoid nephrosis is discussed.

LESLIE, Evanston, Ill.

TREATMENT OF NOCTURNAL ENURESIS WITH MALE SEX HORMONE. F. DIETEL, München. med. Wchnschr. **82**:787 (May 16) 1935.

Dietel treated twenty-two children over 10 years of age who were subject to nocturnal enuresis with tablets of male sex hormone, as suggested by Bodechtel. Twelve of the children were ambulant patients, and the others were in the hospital. Dietel was careful to reduce psychic factors as much as possible. The results were not satisfactory; in most cases the treatment had no effect.

BRAHDY, Mount Vernon, N. Y.

HISTOLOGIC INVESTIGATION OF THE FOETAL KIDNEY: II. EXPERIMENTAL STUDY OF THE RENAL DISTURBANCE IN THE FOETAL PERIOD. S. TSUDA, Jap. J. Obst. & Gynec. **18**:233 (June) 1935.

Pregnant rabbits were given subcutaneous injections of either a 1 per cent aqueous solution of uranium nitrate or cantharidin and were killed after a period of observation. In the maternal kidneys, especially after the injection of the uranium, the convoluted tubules became edematous and occasionally closed. There were a few hemorrhagic areas. With cantharidin there was also some glomerular change. The fetal kidneys showed only edema of the tubules, and there was no difference in the results with the two substances.

ADAIR and POTTER, Chicago.

Diseases of the Ductless Glands; Endocrinology

THE INFLUENCE OF PITUITARY GROWTH HORMONE ON THE PHOSPHATASE ACTIVITY OF BONE AND KIDNEY. WALTER E. WILKINS, J. ALFRED CALHOUN, COBB PILCHER and EUGENE M. REGEN, Am. J. Physiol. **112**:477 (July) 1935.

Adult rats were used in a study to determine whether daily injections of the pituitary growth hormone would increase the phosphatase activity of the bones. No increase was found.

NOURSE, Cleveland.

THE PRIMACY OF POLYURIA IN DIABETES INSIPIDUS. CURT P. RICHTER, Am. J. Physiol. **112**:481 (July) 1935.

Diabetes insipidus was produced in rats either by a stab wound with a fine scalpel through the sphenoid bone near the anterior margin of the pituitary gland or by total or partial removal of the gland by suction applied through a hole in the sphenoid bone. It was found that polyuria preceded polydipsia by an average of one hour and twenty-one minutes following hypophysectomy, indicating that polyuria is the primary factor in the syndrome of diabetes insipidus. Rats with acute or chronic diabetes insipidus were found to excrete large quantities of urine even when completely deprived of water. The anterior lobe of the pituitary plays an important part in this syndrome; complete removal of the gland does not always produce diabetes insipidus, and when it does the diabetes insipidus is never permanent. On this basis the diabetes insipidus can be accounted for in terms of a disturbance of the balance between the antidiuretic agent from the posterior lobe and the diuretic agent from the anterior lobe.

NOURSE, Cleveland.

THE INCIDENCE OF GOITRE AMONGST SASKATOON SCHOOL CHILDREN. GRIFFITH BINNING, Canad. M. A. J. **32**:533 (May) 1935.

In this study, goiter was considered "slight" when the thyroid was just palpable and was thought to be probably physiologic, "moderate" when the thyroid was easily palpable and usually visible, "large" when the thyroid was very large and surgical treatment was indicated and "toxic" when there were toxic manifestations such as a rapid pulse rate and tremor. With this classification, among 2,963 males and 2,845 females, slight goiter was found in 27.8 per cent of the males and 42.3 per cent of the females; moderate goiter in 8.9 per cent of the males and 20.6 per cent of the females and large goiter in 0.1 per cent of the males and the same number of females. The ages ranged from 6 to 24 years.

The highest incidence was between the ages of 11 and 15 years.

The racial origin seemed to be the factor of greatest importance in the incidence of goiter. This was not due to the diet or the water supply, because at least half of the races in which goiter was most frequent were on the same diet as those of British origin.

MOORE, Omaha.

SUCCESSFUL OVARIAN THERAPY IN A CASE OF PREADOLESCENT EUNUCHOIDISM. H. LISSER, Endocrinology **19**:284 (May-June) 1935.

A 17 year old girl displayed the following characteristics: 1. Disproportionate tallness without actual gigantism; long extremities—the "lower measurement" (the distance from the symphysis pubis to the soles of the feet) markedly exceeded the "upper measurement" (the distance from the symphysis pubis to the vertex), and the span was greater than the height; long, slender fingers, and long, narrow feet. 2. Retarded bone age, owing to delayed closure of the epiphyses. 3. Incomplete development and late appearance of the secondary sex characters (absence of menstruation, an infantile uterus, lack of mammary development and absence of pubic hair).

Her physical appearance simulated that of a eunuch castrated in childhood, and the outlook for normal sexual development seemed poor. She was placed on therapy with a commercial ovarian extract and with estrogenic preparations for three years. The secondary sex characters were stimulated fairly promptly and are now entirely normal. After a year and three months, when the patient was 18½ years old, the first menstrual period occurred, and at 20 years the patient is menstruating regularly every month.

Lisser cannot contradict the critically minded reader who may be disposed to regard the therapeutic effects as strictly coincidental, but he interprets the outcome as a gratifying example of specific endocrine therapy.

JACOBSEN, Buffalo.

IMMUNITY IN DIABETES: II. RELATIVE IMPORTANCE OF NUTRITIONAL STATE AND OF BLOOD SUGAR LEVEL IN INFLUENCING DEVELOPMENT OF THE AGGLUTININ AFTER TYPHOID VACCINE. RUSSELL RICHARDSON, J. Clin. Investigation **14**:389 (July) 1935.

Underfed rabbits with a depleted hepatic glycogen content showed a definitely lower agglutinative titer after being given typhoid vaccine than did well fed controls with a higher hepatic glycogen content. It is suggested that the state of cellular nutrition is more important than the level of the blood sugar in determining the antibody response.

GUEST, Cincinnati.

THE RELATION BETWEEN THE QUANTITY OF THYROID-STIMULATING HORMONE OF THE ANTERIOR PITUITARY GLAND ADMINISTERED AND THE PROLIFERATIVE ACTIVITY AND HYPERTROPHY OF THE THYROID ACINI IN GUINEA PIGS. A. A. KIPPEN and LEO LOEB, J. Pharmacol. & Exper. Therap. **54**:246 (June) 1935.

Kippen and Loeb studied the effect on the thyroid gland of guinea-pigs of the acid extract of cattle anterior pituitary injected intraperitoneally. The criterion used was the change in the cellular mitoses of the thyroid. After two daily injections of either small or large doses there was an equally remarkable increase in the mitotic figures. However, with succeeding injections with the smaller doses there was a sharp decrease in the mitoses, while with the large doses the mitosis was maintained much longer. The mechanism of the return of the cells to the normal was not explained; it was not due to the formation of antibodies.

The cellular changes are striking. The findings show that it is possible "by means of two injections of 2 cc. of extract of anterior pituitary gland, to raise the proliferative index of the thyroid gland of the guinea-pig about a thousand times, namely from an average of 150 mitoses to a maximum of about 190,000, within as short a time as two days."

The short article well repays careful reading.

PILCHER, Cleveland.

A CASE OF HYPERINSULINISM RELIEVED BY PARTIAL PANCREATECTOMY. J. ALLAN BERRY, Brit. J. Surg. **23**:51 (July) 1935.

Cases of hypoglycemia may be divided into: (1) those in which the condition is due to functional hyperinsulinism, the cause being either increased number, size or activity of the islands of Langerhans; (2) those in which the condition is due to the presence of an adenoma or carcinoma of the pancreas; (3) a medley of cases which come under the heading of dysinsulinism, which are dependent on pituitary, adrenal, hepatic or other factors.

Hyperinsulinism due to tumor of the pancreas is treated by removal of the tumor. The results are good. In the past, removal of part of the pancreas for functional hyperinsulinism has been disappointing. This may have been due to the fact that only small amounts of pancreatic tissue were resected. It has been suggested that in order to obtain satisfactory results one half of the organ should be removed. At present there is no way to distinguish between cases of functional hyperinsulinism and those of adenoma of the pancreas. Berry suggests that a differential diagnosis might be made by studying the blood sugar tolerance following the administration of various amounts of dextrose, as he found that with large doses of dextrose the blood sugar level tends to fall and that there is a rise in the blood sugar level during starvation.

SUMMERFELDT, Toronto, Canada.

A Case of Chondrodystrophy. Carle Roederer, Bull. Soc. de pédiat. de Paris **32**:688 (Dec.) 1934.

A boy, 13 years old, was short and presented deformities of the extremities and the spine. A number of roentgenograms are reproduced which show abnormalities of the bones. This condition was considered to differ in many respects from the entity of a chondroplasia of Ollier, and so the term "chondrodystrophy" has been used, which is not to be interpreted as chondrodystrophia foetalis or achondroplasia.

Benjamin, Montreal, Canada.

Case of Congenital Goiter. F. Mortillotti, Pediatria **43**:817 (July) 1935.

A case of congenital goiter is reported in a new-born boy, whose mother suffered from goiter. The author discusses the differential diagnosis, pathologic characteristics and several theories concerning the etiology of the condition.

Signorelli, New Orleans.

Hypertrophy of the Thymus. Athayde Fonseca, Arch de pediat., Rio de Janeiro **7**:338 (April) 1935.

Thymic hypertrophy can be recognized by sternal retraction on palpation, incomplete inspiration, dulness to the right of the sternal border on percussion and roentgenograms. The treatment is exposure to the roentgen rays.

Sanford, Chicago.

Hyperthymization and Experimental Hyperthyroidism. H. Hanke and E. Widmann, Deutsche Ztschr. f. Chir. **243**:772 (Nov. 5) 1934.

Hanke and Widmann wished to discover whether there is any relationship between the thymus gland and hyperthyroidism. Guinea-pigs weighing from 230 to 250 Gm. on a standard diet were used as experimental animals. A preparation of the thyrotropic substance of the anterior lobe of the hypophysis and a thymic extract 1 cc. of which corresponded to 10 Gm. of fresh thymus gland were injected intraperitoneally, not together but at alternating periods of from six to eight hours daily for ten days. The animals were then killed. By injection of the thyrotropic hormone of the anterior lobe of the hypophysis it was possible to produce in experimental animals (guinea-pigs, rabbits, dogs, cats and rats) not only the clinical symptoms of hyperthyroidism in man, such as tachycardia, tremor, exophthalmus and decreased glycogen in the liver, but also a histologic change in the thyroid gland similar to that occurring in cases of toxic goiter in man. The thymic extract used was the water-soluble protein and fat-free extract of Asher. The thymic extract alone produced no reaction in the thyroid gland, though a striking decrease in the sodium content of the liver and blood was noted. The thyrotropic extract produced its typical effect neither inhibited nor increased by the thymic extract. The authors conclude that their experiments indicate that the thymus gland has no effect in inhibiting or favoring thyrotoxicosis and that there is no good reason for thymectomy in patients with that condition.

Glaser, Rochester, N. Y.

Effect of Preliminary Feeding and Administration of Insulin on Hyperglycemia Due to Epinephrine. R. Boller and K. Makrycostas, Wien. Arch. f. inn. Med. **27**:179 (July) 1935.

Following the injection of epinephrine hydrochloride the curve for blood sugar is not influenced by a preliminary intake of food. Continued administration of insulin in the preliminary period can heighten the effect of epinephrine on the blood sugar content. This effect takes place particularly when the insulin is given along with a diet low in carbohydrate. The injection of epinephrine hydrochloride,

combined with the dextrose test, will show that the increased permeability of the liver for sugar, as it occurs with feeding a low carbohydrate diet and giving insulin, can be obviated or distinctly modified. SCHLUTZ, Chicago.

CONGENITAL STRUMA. J. SLOOFF, Maandschr. v. kindergeneesk. **5**:18 (Oct.) 1935.

Congenital struma is rare in Netherlands; in the southern part it occurs fairly frequently. The author observed there (in Eindhoven) five cases within three years. He describes the cases and furnishes a number of illustrations. In two cases there seemed to be a relation to the use of iodine by the mother during pregnancy. In one of these two cases operation was necessary; the child was 3 days old and died some hours after the operation. In other cases there were indications of a hereditary factor. With the exception of the case in which operation was performed, all the children received iodine therapy with success. In one case hyperplasia of the thymus also existed.

VAN CREVELD, Amsterdam, Netherlands.

A CASE OF INTRALARYNGOTRACHEAL GOITER. J. L. M. GERMAN, Nederl. tijdschr. v. geneesk. **79**:1250 (March 23) 1935.

In a boy of 10 years an intralaryngotracheal goiter was accidentally found. During the treatment of recurring papilloma the occurrence of severe cutaneous and mediastinal emphysema made the existence of an anomaly evident. Microscopic examination showed the real nature of the disturbance. The function of the thyroid gland was not lowered. VAN CREVELD, Amsterdam, Netherlands.

Diseases of the Muscles, Bones, Joints and Lymph Glands

AMYOTONIA CONGENITA WITH FAMILIAL INCIDENCE. SAMUEL HURWITZ and MARK GERSTLE JR., Arch. Neurol. & Psychiat. **33**:1317 (June) 1935.

A case of amyotonia congenita with striking familial incidence is described. The hospital record indicated that a brother and a sister of the patient, who had died of infections of the respiratory tract, had the same condition. A cousin on the father's side had general muscular weakness and died of pneumonia. The father and children were of the same blood group. Other authors have reported several cases in one family. BEVERLY, Chicago.

THE VARIABILITY OF NON-HEMOGLOBIN IRON. THEODORE G. KLUMP, J. Clin. Investigation **14**:351 (May) 1935.

From determinations of the oxygen capacity and the total iron content of the blood of fifty-seven subjects under various conditions values for the nonhemoglobin iron content were obtained. The nonhemoglobin iron content constituted a significant fraction of the total iron content, so that attempted calculations of values for the iron content of the hemoglobin from the total iron content of the blood were subject to an average error of 5.3 per cent and a possible error as great as 17.8 per cent. GUEST, Cincinnati.

ARTHRITIS IN CHILDREN. ROBERT W. JOHNSON JR., M. Clin. North America **18**:1673 (May) 1935.

By taking into account factors favoring the incidence of certain specific types of arthritis in children, many diagnostic difficulties may be avoided. Congenital defects and abnormalities such as congenitally dislocated hips are not met with in adult life except in their final stages. Nutritional disturbances particularly afflict the young and when manifest as scurvy and rickets frequently lead to acute or chronic irritation and disability of the joints. The growth processes active

in childhood render the structures of the joints more plastic and may give rise to such conditions as Legg-Perthes' disease, femoral epiphyseolysis, Köhler's disease and spinal epiphysitis. Congenital syphilis involves the joints in infants and children much more frequently than the acquired disease in adult life. The greater susceptibility to acute infectious disease in the young and the low resistance of children account for the greater incidence of acute pyogenic arthritis at this age. The child's mode of life favors infection in ways not usual among adults. His habit of putting in his mouth all objects which come to hand when creeping about the floor greatly increases the danger of infection and accounts in part for the frequent occurrence of tuberculous arthritis at this age.

On the other hand, in considering arthritis occurring in children one can automatically eliminate from consideration those types due to degenerative changes, such as hypertrophic arthritis or osteo-arthritis, and those resulting from metabolic disturbances such as gout and osteomalacia. Peculiar to the adult likewise are the neurotrophic degenerative lesions of syringomyelia and tabes. Neoplasms in childhood are diaphyseal conditions and scarcely ever involve the joints.

Notwithstanding the labors of many workers, the sum of the present-day knowledge of arthritis is far from satisfactory. This ignorance is not static, however, and the future holds the promise of much better understanding of this baffling condition.

EUGENE SMITH, Ogden, Utah.

THE OSTEOCHONDRITIDES. H. A. SWART, West Virginia M. J. **31**:304 (July) 1935.

A group of diseases involving the growth centers of bones and bearing the names of men who first described them—Perthes, Osgood, Scheuermann and others—are discussed. They are of unknown etiology. Diagnosis is made by the history and by examination and roentgenography. This is a brief but interesting discussion of these diseases, with a review of the symptoms, diagnosis and treatment, but presents nothing new, unusual or original.

SHAWKEY, Charleston, W. Va.

THE DIAGNOSIS OF ABNORMAL HIP CONDITIONS IN CHILDREN. M. FORRESTER-BROWN, Lancet **1**:1377 (June 15) 1935.

The conditions encountered were: (1) congenital dislocation of the hip, (2) rickety coxa vara, (3) coxa plana, (4) slipping of the upper epiphysis of the femur, (5) coxa valga, (6) tuberculosis of the hip, (7) nontuberculous arthritis of the hip, (8) osteomyelitis and (9) purpura with hemorrhage into the joint.

The author states that "the history of hip conditions in children is seldom very enlightening and sometimes positively misleading." The importance of a thorough physical examination, with particular attention to the gait, the posture, the power to balance on one leg, the measurement of the limbs, the range of motion of the joints and palpation of the hip joints, is emphasized. The treatment is not discussed.

LANGMANN, New York.

A CASE OF INFANTILE COXA VARA. J. ROWAN ARMSTRONG, Lancet **1**:1498 (June 29) 1935.

A girl, aged 9 years, came for examination because of left-sided limp, possibly of six months' duration. She had no pain and little disability. There was 1 inch (2.54 cm.) shortening of the left leg, with wasting of the muscles of the left thigh. She showed 50 per cent limitation of abduction of the left hip and some limitation of adduction and rotation. Easily corrected scoliosis was also present. Roentgenography showed left-sided coxa vara.

In considering the etiology of infantile coxa vara the difficulty is to explain the presence of the triangular fragment of bone typical of the condition. The author speculates on the etiology and comes to the conclusion that the deformity is probably due to abnormal ossification of the neck of the femur.

LANGMANN, New York.

A Case of Dyschondroplasia. M. Boppe, J. A. Lièvre and Franco, Bull. Soc. de pédiat. de Paris **32**:34 (Jan.) 1934.

A boy, aged 2½ years, had marked deformities of the skeleton. These were characterized by disturbance of development and localized lesions in the diaphyses of the long bones of the extremities and, to some extent, in both ilia. There were longitudinal zones of cartilage between bands of bone, appearing as striations in the roentgenograms. Cystic osteitis or Recklinghausen's disease and chondromatosis are mentioned, but the condition is considered to correspond more closely to dyschondroplasia, as described by Ollier and Molin, the cause of which is obscure.

Benjamin, Montreal, Canada.

A Case of Craniofacial Dysostosis Not Hereditary or Familial. H. Grenet, J. Lévesque and P. Isaac-Georges, Bull. Soc. de pédiat. de Paris **32**:75 (Jan.) 1934.

A girl, 21 months old, showed a marked cranial deformity consisting of brachycephaly and a frontal ridge; ocular lesions consisting of exophthalmos, divergent strabismus and optic neuritis, and facial deformities, such as widening of the bridge of the nose, which was of aquiline shape, atrophy of the upper jaw and prognathism of the lower jaw. The clavicles were normal. The parents and the other children in the family showed no malformations. The congenital anomaly which this child presented and which fits in the category described as craniofacial dysostosis is rare.

Benjamin, Montreal, Canada.

Obesity, Dwarfism and Multiple Osseous Dystrophies. H. Grenet, J. Lévesque and P. Isaac-Georges, Bull. Soc. de pédiat. de Paris **32**:79 (Jan.) 1934.

A girl, 9 years old, presented an abnormal appearance which resembled somewhat the picture seen in achondroplasia. She was markedly obese and very short. The fingers and toes were short and thick, as were the hands and feet. Her intelligence was normal. Physical examination showed no essential abnormalities except for the characteristics mentioned. There was no evidence of thyroid disturbance. The blood had a slightly prolonged bleeding time but was otherwise normal. Roentgenoiogic examination revealed abnormalities of the skeleton. The extremities of the long bones were greatly widened and showed evidence of decalcification, the picture resembling slightly the lesions seen in rickets. In some long bones the metaphyseal line of ossification was well retained, but the diaphyses of some of the bones were bowed and in places showed cortical thickening. The spine showed kyphoscoliosis in the lower dorsal region, and the sixth dorsal vertebra was narrowed on the left side. The sella turcica was narrow and deep; this might be taken as evidence of a pituitary disturbance. The child manifested no signs of congenital syphilis. A photograph of the patient is reproduced with the report of her case. The etiology and pathogenesis of the abnormalities which she showed remain obscure.

Benjamin, Montreal, Canada.

Case of Costal Aplasia with Symptomatic Kyphoscoliosis. E. Sorrel, Le Grand-Lambling and L. Mérigot, Bull. Soc. de pédiat. de Paris **32**:170 (March) 1934.

A girl, 12 years old, showed congenital partial absence of the left third rib, which was demonstrated roentgenographically when she was brought to the hospital with the complaint of scoliosis. There was no other abnormality of the bones. Malformation of a single rib resulting in scoliosis, without any other osseous abnormality, is considered rare, and a case is, therefore, of sufficient interest to report. Treatment was directed toward correction of the scoliosis, apparently by means of suitable exercises, without an attempt to correct the defect of the rib.

Benjamin, Montreal, Canada.

HEMOLYTIC ARTHROPATHY. LANCE, Gaz. d. hôp. **108**:724 (May 25) 1935.

This is a concise and clearly written review of the subject.

KAJDI, Baltimore.

MYASTHENIA GRAVIS AND THYMIC TUMOR. ERNST GOLD, Wien. klin. Wchnschr. **48**:694 (May 18) 1935.

According to Gold, a causal relation between myasthenia and the parathyroid glands cannot be proved by either pathologic-anatomic or pathologic-physiologic methods. Disturbances in the magnesium metabolism do not appear to persist. Further, the assumption that myasthenia develops on the basis of status thymicolymphaticus no longer finds any support. The attempt to treat myasthenia by extirpation of any existing thymic tumor appears to be justified and may result in clearing up of the problem of myasthenia.

ABT, Chicago.

PATHOLOGICAL OBSERVATIONS ON A CASE OF HAND-SCHÜLLER-CHRISTIAN'S DISEASE. T. TOKUYAMA, J. Pediat. (Tokyo), no. 418, March 20, 1935, p. 315.

Tokuyama reports a case of xanthomatosis in a boy 11 years and 1 month old, demonstrating the typical lipoid cells in the liver, lymph nodes, kidneys, retinas, adrenals, hypophysis, central nervous system, lungs and heart. The lipoid changes were negligible in the intestinal tract, genital organs, pancreas and thymus. The most interesting observation was the demonstration of islands of xanthoma cells in the haversian canals in the cortical tissues of the bones, particularly the cranial bones and the ulna. A complete analytic tabulation of eighty-eight cases reported from all parts of the world is given.

KATO, Chicago.

Diseases of the Eye

THE CHIEF PREVENTABLE BLINDING DISEASES OF CHILDHOOD. R. E. WRIGHT, J. Madras Univ. **6**:172 (Aug.) 1934; **7**:1 (Jan.) 1935.

LECTURE I. DEFICIENCY DISEASE AND TRACHOMA

Keratomalacia.—The first symptom of this disease is night blindness, and the earliest obvious sign is a peculiar smokiness of the conjunctiva. With progression of the disease, marasmus sets in. There are a diminution of secretion and an abnormal dryness of the nasal, oral and pharyngeal membranes. Usually the conjunctiva becomes dry, wrinkled and greasy-appearing, and the cornea becomes dull, lusterless and finally opaque, eventually undergoing necrosis and ulceration, with loss of the eye, if untreated. Occasionally one finds a wet, dull, red conjunctiva. Bitot's spots are present adjacent to the nasal and temporal limbus. The patients may be restored to health but remain blind because of the resulting dense leukomas of the cornea or because of staphylomas.

Even in extreme cases the child can be restored to comparative health by cod liver oil. If the child cannot take the oil by mouth, it is possible to save its life by wrapping it in a flannel binder soaked in the oil. The disease is apparently due to a deficiency of vitamin A, although vitamins B, C and D may also be concerned. No remedy as effective as crude cod liver oil has yet been found, and the average quantity necessary for small children need not exceed 7½ minims (0.46 cc.) per day, by mouth.

The incidence of cases of total and practical blindness due to keratomalacia is approximately 3 per thousand cases of ocular disease seen at the hospital.

Prevention of this disease, which is probably responsible for more blindness in young children in India than any other single condition, depends entirely on an improvement in diet and in living conditions.

Trachoma.—Wright believes that the early stages of this disease are so indefinite that one can only record a suspicious case as that of a trachoma-like condition and should not subject the patient to some of the appalling treatments at present in vogue which produce changes in nontrachomatous tissue that may be mistaken for later stages of the disease itself.

In India, trachoma is a disease more frequently found in Mohammedans (especially the women) than in Hindus (in whom it is more common among the Brahmins). Its incidence varies from 3.5 to 50 or 75 per cent of the total number of cases of ocular disease treated in several widely scattered ophthalmic teaching centers in India. It is associated with overcrowding, indoor living, confined dark unventilated housing and the purdah rather than with poverty per se. It appears to be more common in groups of Indians who habitually drape the head and face with clothing, and it is not particularly prevalent among rural Indians who go practically naked. It seems to be a disease of the "great unwashed." While not important as a cause of blindness in children of preschool age, yet it is one of the factors responsible for preventable blindness in young people. Treatment is ineffective unless patients are followed up, for relapses are common. Copper sulfate is still one of the most generally used and effective medicaments.

The prevention and eradication of trachoma in India depend on better housing conditions, social education and the emancipation of women. This is, of course, a public health problem.

LECTURE II. VENEREAL DISEASE AND CORNEAL TRAUMAS AND ULCERATIONS

Ophthalmia Neonatorum.—While this disease accounts for about 10 per cent of the total blindness in England and Wales, it is not the greatest cause of preventable blindness in Indian children, its incidence averaging about 2.1 per thousand cases of ocular disease in hospitals. Even when it occurs it seldom produces blindness. In India, one probably deals with a less virulent strain of the gonococcus than that responsible for the disease in England.

Credés method of prophylactic treatment, if properly carried out, is still the most certain way of preventing the disease.

Congenital Syphilis.—Parenchymatous keratitis (interstitial keratitis or uveitis anterior) is one of the most important of the stigmas of congenital syphilis producing blindness. Its incidence averages 1.5 per thousand cases of ocular disease in hospitals. Although not common during the first five years of life, it may be regarded as a disease of childhood since the infection producing it is present at birth. Its prevention depends on (1) the prevention and cure of syphilis in adults since it is very amenable to treatment and (2) a greater emphasis by the government on the control and cure of this disease rather than of tuberculosis and leprosy, which tend to disappear naturally with the betterment of social conditions.

Smallpox.—Of 726 opacities of the cornea (leukomas and nebulae) seen during 1929, 59 followed smallpox, 2 followed ophthalmia neonatorum, 92 followed the use of irritant remedies, 68 followed injuries, 54 followed ulcers, 41 followed trachoma, 18 followed keratomalacia, 14 followed syphilis, and 378 were of unknown origin. Of 143 anterior staphylomas (ectatic corneal scars), 16 followed smallpox, 35 followed the application of irritant remedies, 31 followed injuries, 2 followed ulcers, 6 followed keratomalacia, and 53 were of unknown origin.

As, in the six years from 1928 to 1933, from 37 to 47 per cent of the children surviving at 1 year escaped vaccination in the Madras Presidency, it is apparent that, with more universal vaccination, the cases of blindness due to smallpox could be prevented.

Irritant Remedies.—Approximately 6 per thousand persons of the hospital population were rendered partially or totally blind by irritant remedies in 1920. About one third of these were totally blind. Blindness from this cause, peculiar to children in the East, is due to superstition and ignorance. The various irritants used include tobacco juice, red-hot coals, alum, chillies, urine and dung.

The only method of preventing such practices is that of education by means of posters, lectures, leaflets and other types of health propaganda.

LECTURE III. HEREDITARY DISEASES

The cases of hereditary disease causing impaired vision or blindness number 4.55 per thousand ophthalmic patients in hospitals. The cases may be grouped (Treacher Collins) into (*a*) those in which the tissue involved has from the first been imperfectly developed (buphthalmos, ectopia lentis, colobomas, microphthalmus, anophthalmos, congenital cataract, tower skull, etc.) and (*b*) those in which, after full development, degeneration sets in (the tapetoretinal degenerations, progressive macular degeneration with or without dementia and with or without pigmentation, familial choroiditis, Tay-Sachs disease, gyrate or total atrophy of the retina and choroid, hereditary optic atrophy, familial corneal degenerations, etc.). Gowers devised the term "abiotrophy" to characterize the latter group.

In India, retinitis pigmentosa seems to be definitely associated with consanguineous marriages.

Prevention is possible only by sterilization of those known to be transmitters of hereditary blinding diseases. In the course of time this would accomplish much good.

DUGGAN, New York. [ARCH. OPHTH.]

Skin Diseases; Allergy

RADIUM DOSAGE AND TECHNIQUE IN BENIGN LESIONS OF THE SKIN. HOWARD MORROW and LAWRENCE R. TAUSSIG, Am. J. Roentgenol. **32**:735 (Dec.) 1934.

The limitations of the use of radium due to the danger of late sequelae, such as telangiectasia, atrophy, keratosis and malignant growth, are outlined, and a method of guarding against them is given. Roentgen therapy has proved superior to the use of radium in the treatment of many diseases, such as psoriasis, lichen planus, eczema, etc. The authors outline the treatment and give the dosages of radium for the following conditions: congenital anomalies, such as vascular and fleshy nevi, and acquired conditions, such as keloid, verruca, synovial cyst and epulis.

SQUIRES, Chicago.

USE OF MAIZE OIL (UNSATURATED FATTY ACIDS) IN THE TREATMENT OF ECZEMA: PRELIMINARY REPORT. THEODORE CORNBLEET and EARLE R. PACE, Arch. Dermat. & Syph. **31**:224 (Feb.) 1935.

For the past four and one-half years the authors have been giving refined maize oil to patients with eczema. The dose was increased until the patient took as much as four tablespoonfuls three times a day. It is believed that the benefit obtained is due to the unsaturated fatty acids contained in the oil. The disadvantage of the treatment is that it takes from twelve to eighteen months for a clinical cure. The patients had a marked exacerbation of the eczema before it finally cleared. The authors had marked success with their cases but realize the need of thorough corroboration of this work.

DULIN, Iowa City.

NUTRITIONAL TREATMENT OF ACNE VULGARIS. CHARLES LERNER, Arch. Dermat. & Syph. **31**:526 (April) 1935.

The sodium and not the chlorine ion of table salt produces the unfavorable effect on various dermatoses. With this in view the author treated twenty patients with

acne vulgaris of various types by the administration of an equilibrated salt. Favorable results were obtained in cases of the pustular and indurated types. Sodium chloride was equilibrated with potassium, calcium and magnesium, so that the cations were contained in the same proportion as that found in blood serum. Two formulas are given, one for parenteral injection and the other for oral administration. The patients were given daily injections of the salt solution when possible and were instructed to use only the equilibrated salt on their food. No restrictions as to the amount of carbohydrate, protein or fat were made, but instructions in regard to diet were given, so that the intake of vitamins was adequate. The author realizes the drawbacks of a treatment requiring daily injections.

DULIN, Iowa City.

CUTANEOUS MONILIASIS ASSOCIATED WITH ORAL THRUSH: AN UNUSUAL CASE. J. G. DOWNING and J. B. HAZARD, Arch. Dermat. & Syph. **31**:636 (May) 1935.

The case is reported of a boy aged 15 years who had a "horny" eruption of the face for eighteen months. Eight years before he had "canker sores" on the lips, gums and tongue, and during the following three years a thick white coating with small red patches formed on the mucous membrane. Various treatments for thrush produced no improvement. The results of complete mycologic studies of material from the lesions of the face and tongue are included. After hospitalization and subsequent observation in the outpatient department, the lesions were improved until only pitted scars remained. The treatment consisted in the application of hydrous wool fat, boric acid ointment or salicylic acid and sulfur ointment, with ultraviolet irradiation and a diet high in vitamins. The patient died five months later of acute pulmonary tuberculosis.

DULIN, Iowa City.

DIETETIC TREATMENT OF NEURODERMATITIS IN CHILDHOOD. ERWIN SCHIFF, Arch. Pediat. **52**:44 (Jan.) 1935.

This article is one of a series of lectures delivered at the Bronx Hospital in the city of New York. The writer discusses the treatment of neurodermatitis in childhood. The discouraging features of this condition are stressed, and an outline of the writer's dietetic treatment is presented. It is believed that much can be done in these cases by dietetic measures. The treatment consists largely of a diet of raw vegetables and fruits. For details the reader is referred to the original article.

WADDELL JR., University, Va.

A STUDY OF FAVISM IN INFANCY. ANGELO CHIEFFI, Pediatria **43**:361 (April) 1935.

Chieffi gives a thorough historical review of a clinical syndrome splendidly described by Montano in 1894, characterized by icterus, hemoglobinuria and elevation in temperature, called "favism." This condition, which was formerly prevalent throughout the Mediterranean basin, is now practically limited to Southern Italy, Sicily and especially Sardinia, where it attains a morbidity of 5.17 per cent and a mortality of about 8 per cent.

The disease, though found in adults, has a predilection for children, in whom its course is grave and fatalities are frequent.

The symptomatology is ushered in by a sudden onset with marked malaise, asthenia, vomiting and occasionally diarrhea, and a sharp rise in temperature, quickly followed by rapidly progressive pallor. The urine is diminished in quantity, and its color, which is red at first, becomes progressively brownish and finally black. On chemical examination the urine shows notable amounts of hemoglobin.

The skin and mucous membranes become pale and gradually become distinctly icteric.

In cases in which the course is mild the hemoglobinuria ceases within two or three days, and the urine becomes of normal appearance, though it contains appreciable amounts of urobilin. The temperature falls by lysis, and the patient progressively regains strength, though the icterus and pallor may persist for a period of from ten days to one month.

Chieffi reports eleven cases of this disease in children under 2 years of age who came under his own observation and states as his opinion that the most effective treatment consists in the use of maternal hemotherapy with transfusion of small amounts of blood in conjunction with injections of a 10 per cent solution of magnesium thiosulfate.

SIGNORELLI, New Orleans.

ALLERGIC ACTION OF COW MILK AND EGG ALBUMIN IN CHILDREN EXHIBITING CUTANEOUS MANIFESTATIONS OF EXUDATIVE DIATHESIS. E. ZAMBRANO and E. PEZZA, Pediatria **43**:642 (June) 1935.

Sixty-three infants exhibiting cutaneous evidence of exudative diathesis were subjected to intracutaneous and complement-fixation tests for the determination of sensitivity to the proteins of milk and to egg albumin.

The observations indicated that specific "anti-bodies" to cow milk protein and to egg albumin are more frequently met with in children with a diathesis than in normal children and that the higher number of positive reactions are found in children in whom acute nutritional disorders coexist.

SIGNORELLI, New Orleans.

LUPUS OF THE MUCOUS MEMBRANE IN CHILDREN. A. JÖRGENSEN, Ztschr. f. Laryng., Rhin., Otol. **26**:186, 1935.

This condition is occasionally seen in infancy. In childhood it occurs with greater frequency in the mouth, nasopharynx and larynx. It tends to greater extension in children, probably because of the better blood supply. The author has occasionally seen lupus of the mucous membranes in children before the sixth year, but more frequently between the ages of 6 and 8 years. Most of his cases were in children from 10 to 14 years of age.

VINTON, New York.

INTRACUTANEOUS REACTION WITH EGG WHITE, EGG YOLK AND COW'S MILK. M. MIYAZAKI, Hifu-to-Hitsunyo **3**:158 (April) 1935.

In 168 patients past school age aqueous extract of egg white was injected intracutaneously into the outer surface of the upper arm, producing a positive (allergic) reaction in 8 (4.76 per cent). Egg yolk injected under identical circumstances produced positive reactions in 3 (1.79 per cent), and cow's milk gave positive results in 4 (2.38 per cent). All three extracts produced positive reactions in the same patient only once (0.59 per cent). The Storm allergen gives a positive reaction more frequently than did the substances used in Miyazaki's experiment and is therefore considered a better reagent in testing for allergy. The Storm allergen also gives a more marked reaction in the allergic diseases of the skin.

From the author's experience, he believes that there frequently is present, in addition to the positive reactions to such extracts, a polyvalent, nonspecific cutaneous supersensitivity toward various other allergens.

BRENNAN, Chicago. [ARCH. DERMAT. & SYPH.]

DIET ABSOLUTELY FREE FROM MEAL AND FLOUR OF CORN IN HAY FEVER. F. H. MEIHUIZEN, Nederl. tijdschr. v. geneesk. **79**:2242 (May 11) 1935.

The author, who is the patient, pleads in favor of the aforementioned diet, which in his own experience gives excellent results.

VAN CREVELD, Amsterdam, Netherlands.

Surgery and Orthopedics

TREATMENT OF FRACTURED SKULLS. CHARLES O. BATES, J. South Carolina M. A. **31**:132 (July) 1935.

The increase in the number of fractures of the skull has been largely due to the more frequent use of the automobile.

Complete rest is of primary importance in the treatment. There is no standardized treatment. Roentgen examination of the skull should be delayed until the patient has reacted from shock. The use of hypertonic dextrose and saline solutions aids considerably; lumbar puncture may also aid in some cases.

The treatment given and the fractured bone should be considered secondary to the brain and the patient as a whole. WESTON JR., Columbia, S. C.

THE VALUE OF THE UREA-CLEARANCE TEST IN URINARY SURGERY. E. W. RICHES and J. DOUGLAS ROBERTSON, Brit. J. Surg. **23**:128 (July) 1935.

Riches and Robertson present the value of the urea clearance test in a series of patients suffering from prostatic obstruction, renal tuberculosis, renal and ureteral calculi, hydronephrosis and a miscellaneous group of renal conditions.

The technic is described in detail. The test has advantages over the other renal tests in that it is a more delicate indicator of fall in kidney function and does not depend on the excretion of foreign substances.

In cases of renal tuberculosis the lowest urea clearance at which nephrectomy was successfully performed was 33 per cent. After operation there was a marked increase in the urea clearance except in two cases, in which there was a secondary infection which caused a diminution of the urea clearance value.

In cases of calculi, hydronephrosis and pyonephrosis the value of the test is not as definite as in cases of a prostatic condition. The effect of infection in lowering the renal function was evident.

In unilateral lesions of the upper urinary tract the total renal function is of little importance; it improves after the removal of the underlying cause, and normal urea clearance may be attained with only one kidney.

SUMMERFELDT, Toronto, Canada.

AVERTIN AS A COMPLETE ANAESTHETIC IN CHILDREN. JOHN BOYD, Brit. M. J. **1**:1120 (June 1) 1935.

The author surveys seven hundred cases of anesthesia with tri-bromethanol in amylene hydrate in children, describing the technic, the result and the possible danger. The conclusions are as follows:

"1. Avertin can be given to children as a complete anaesthetic with safety, provided a careful look out is kept for danger signals and the patient treated accordingly.

"2. Complete avertin anaesthesia in children is better and more suitable than basal anaesthesia followed by an inhalation anaesthetic.

"3. Complete avertin anaesthesia in children approaches more nearly the ideal anaesthetic than any other.

"4. It is much safer in children than in adults, as in the former there is better detoxication and elimination.

"5. The best method of administration to produce complete anaesthesia is to combine avertin 0.175 gram per Kg. body weight with morphine and atropine according to age, and 20 to 30 c.cm. of novocain as a field block.

"6. A 3 per cent solution of avertin is better retained than a 2½ per cent solution.

"7. The depth of anaesthesia is best assessed by nipping the skin of the neck and watching the arm for movements.

"8. The fall in blood pressure is not of serious moment.

"9. Complete avertin anaesthesia is contraindicated in (a) very young and (b) very cachectic children."

ROYSTER, University, Va.

REPLY TO LAUBER'S ARTICLE "VITAMINS AND WOUND HEALING." WOLF VON DRIGALSKI, Beitr. z. klin. Chir. **160**:100, 1934.

Drigalski does not agree with Lauber's statement that disturbance in the healing of wounds is due not to the vitamin A in oil but to the oil itself. He states that his experiments prove otherwise.

On page 101 Lauber replies that he is still continuing his experiments and hopes to discuss this phase of the problem later.

RUBIN, Boston.

"SUDDEN AND UNEXPECTED DEATH" IN INFANTS AND SMALL CHILDREN FOLLOWING OPERATIONS. DISCUSSION OF CLINICAL ASPECTS OF FEVER AND PALLOR IN CHILDREN WHO HAVE UNDERGONE OPERATIONS. ERICH BUMM, Beitr. z. klin. Chir. **160**:225, 1934.

There is a discussion in this article whether sudden death in some cases is due to later manifestation of a latent infection in the lungs or bronchi or whether it is due to so-called status thymicolymphaticus. Because the pathologic findings in many cases are not positive, it is important to study all cases in a complete manner in order to throw more light on the subject.

RUBIN, Boston.

POSTOPERATIVE COMPLICATIONS AND THE WEATHER. E. RAPPERT, Deutsche Ztschr. f. Chir. **244**:537, 1935.

In a study of a series of postoperative complications Rappert found that 90 per cent occurred in changeable weather and only 10 per cent in indifferent weather. About 50 per cent of the complications occurred when the weather turned cold and about 30 per cent when the weather turned warm. In fatal pulmonary embolism the percentages are reversed. It is not clear what atmospheric factors are concerned with these observations. It is assumed that the factors are probably fine atmospheric vibrations or are concerned with atmospheric electrical phenomena. The vegetative nervous system is probably the mechanism through which atmospheric influences act. It is suggested that when operations are not urgent the condition of the weather and its probable changes should be considered in the choice of the time of operation.

GLASER, Rochester, N. Y.

FLATFOOT AND CLUBFOOT IN CHILDHOOD. J. J. BRUTEL DE LA RIVIÈRE, Nederl. tijdschr. v. geneesk. **79**:2235 (May 11) 1935.

With the progress of the period of growth the number of cases of clubfoot shows a decrease. The decrease is greatest in the period of from 3 to 6 years. A relation is supposed to exist between this decrease and the straightening of the angle between the corpus tali and the collum tali (angle of declination). The number of cases of flatfoot also decreases during growth. This decrease is thought to be connected with the decreasing mobility of the articulations of the foot and with unknown factors which bring about an increase in the height of the arch of the foot. The decrease in the number of instances of flatfoot is not interfered with in those cases in which a definite valgus position exists. From the data of this inquiry conclusions are drawn concerning the indication for treatment of flatfoot and clubfoot in school children to the effect that generally an expectant attitude is justified, as the majority of these deformities correct themselves during growth, and that only those children require treatment in whom the valgus position is caused by debility of the supporting mechanism.

VAN CREVELD, Amsterdam, Netherlands.

Teeth and Dentistry

CHANGES IN THE TEETH AND BONE IN CHRONIC FLUORIDE POISONING. CHARLES J. SUTRO, Arch. Path. **19**:159 (Feb.) 1935.

Feeding sodium fluoride to rats caused changes in the enamel of the teeth within six weeks and histologic changes in the matrix of the bones within one year. These changes were due principally to a chemical disturbance and not to the parathyroid glands. The bones became osteosclerotic after long continued feeding of the fluoride. This suggests the advisability of investigating marble-bone disease from this point of view. LEMASTER, Evanston, Ill.

NOTES ON THE SOMATOLOGY AND PATHOLOGY OF ANCIENT EGYPT. R. WOOD LEIGH, J. Am. Dent. A. **22**:199 (Feb.) 1935.

On the basis of his study of the Egyptian collection in the museum of anthropology of the University of California and of measurements made on two hundred and thirty skulls, Dr. Leigh makes the following comment: Attrition, that is, the wearing off of the occlusal surfaces of the teeth, was practically universal. There was evidence of accompanying periodontal disease. The exposure of the dental pulp with attendant apical infection was common. Radicular cysts were found particularly above the upper incisor teeth; none was found in the mandible. In approximately 10 per cent of the skulls examined there was evidence of chronic maxillary sinusitis, frequently with sinuses draining through the alveolus of a missing upper molar. Accretions or deposits of inorganic salts on the surfaces of the teeth were found much more commonly after the Coptic era and were attributed to the refinement of diet under Greek influence. With the appearance of these deposits there was then, as now, an increase in the incidence of periodontal disease There was evidence of osteo-arthritis, of which the deforming type was most common. No evidence of syphilis and rickets was found, and cases of hypoplasia and atypical teeth were rare. There was no evidence of any dental procedure, except the simplest type of extraction.

Except for attrition, which was previously mentioned, the teeth of the skulls of predynastic times were in the best condition. In the Byzantine and Coptic periods accretions and absorption of the alveolar process occurred, and when the Ptolemies ruled and food was refined, caries and alveolar degeneration were rampant. NOYES, Chicago.

DECIDUOUS TEETH AND THE DISEASES OF CHILDHOOD. ROBERT C. ELLIS and MIRIAM LUTEN, J. Am. Dent. A. **22**:1117 (July) 1935.

From observations made on one hundred and ninety-one patients in a small children's hospital and in the outpatient department of the same hospital, fifteen, or 14.9 per cent, were found to have abscessed deciduous teeth only. Of the seventeen children for whom a definite diagnosis of general disease was made, none had abscessed deciduous teeth only, and nine had infected teeth and tonsils, while eight had infected tonsils only. Of thirty-six patients in this group who did not have general disease, twelve had abscessed deciduous teeth only, and sixteen had infected deciduous teeth and tonsils, while eight had infected tonsils only.

"Cultures from abscessed deciduous teeth yielded only species characteristic of the normal flora of the mouth." Streptococci and staphylococci predominated; agglutination reactions with the patients' serums were essentially negative. The injection of cultures from the teeth and tonsils into animals produced lesions bearing no anatomic relationship to the disease in the patients from whom they came. NOYES, Chicago.

First Permanent Molar: Its Condition at Birth and Its Postnatal Development. Rudolf Kronfeld, J. Am. Dent. A. **22**:1131 (July) 1935.

This paper is a partial report of a study of serial histologic sections from more than two dozen specimens of the human jaw; the subjects ranged in age from birth to 15 years. The paper deals specifically with certain controversial phases of the development of the first permanent molar tooth. Following a careful review of the principal opinions on the subject, Kronfeld presents data illustrated with photomicrographs and a table compiled from the findings for the specimens studied, giving the degree of calcification of this tooth at varying age intervals. Among his conclusions are the following:

There is either no calcification or calcification of only the tip of one (mesiobuccal) cusp of the first permanent molar at birth. This applies to both jaws. About the third month after birth the separate cuspal centers of calcification have appeared. Their relative position within the crypt seems to be fixed rather than as described by some authorities. The cusps begin to unite at from 1½ to 2 years of age, and the crown is fully calcified at 3½ years of age. The occlusal fissures are normal structures in human and other mammalian dentition. While these fissures may furnish a favorable site for dental caries, they cannot be said to cause the disease. In the growth of the tooth the changes conform to the vertical growth of the jaws. Hertwig's sheath at the inferior or apical region is a relatively fixed point.

Noyes, Chicago.

Miscellaneous

The Value of Institutional Rehabilitation of Malnourished and Recently Ill Children. Reginald A. Higgons, Arch. Pediat. **52**:73 (Feb.) 1935.

The writer points out the pertinent fact that many children are being discharged from hospitals or clinics in no fit condition to stand the stress and strain of their home environment. The home conditions of many of these children greatly delay or perhaps permanently prohibit complete convalescence of the child, who is left in a condition of lowered resistance and is made subject to further attacks of acute illness requiring hospitalization. The need for more convalescent homes connected with hospitals is pointed out.

With this in mind, the writer describes the working of such an auxiliary institution connected with St. Luke's Hospital in the City of New York. He describes in detail the setup of this institution and points out the many physical and mental advantages to be derived from such an environment.

Waddell Jr., University, Va.

Fatal Poisoning with Oil of Chenopodium in a Negro Child with Sickle Cell Anemia. I. J. Wolf, Arch. Pediat. **52**:126 (Feb.) 1935.

A case of fatal poisoning due to oil of chenopodium in a Negro child suffering from sickle cell anemia is reported. The child received the total dosage of 16 minims (0.99 cc.) of oil of chenopodium in two courses of 8 minims (0.49 cc.) each at an interval of two weeks. When admitted to the hospital the child was comatose and markedly dehydrated, and respirations were deep, sighing and abdominal.

Autopsy revealed bronchopneumonia, edema of the subarachnoid space and brain, parenchymatous degeneration and fatty infiltration of the liver and kidneys, retroperitoneal infiltration of tissue surrounding the left ureter and sickle cell anemia. Similar cases of poisoning with oil of chenopodium reported in the literature are reviewed, with a discussion of the usual dosage and the danger in the use of the drug.

Waddell Jr., University, Va.

THE QUANTITATIVE SPECTROGRAPHIC ESTIMATION OF BLOOD LEAD AND ITS VALUE IN THE DIAGNOSIS OF LEAD POISONING. HAROLD BLUMBERG and T. F. MCNAIR SCOTT, Bull. Johns Hopkins Hosp. **56**:276 (May) 1935.

The authors have applied a quantitative spectrographic estimation of the blood lead content, requiring 5 cc. of blood and twelve hours for completion, to more than two hundred control samples and to samples of blood from thirty-six patients with clinical plumbism.

Values for the blood lead of from 0.005 to 0.1 mg. per hundred cubic centimeters are considered to be clinically negative and to eliminate the diagnosis of lead poisoning. Values of from 0.1 to 0.2 mg. are called borderline and indicate subclinical lead poisoning or mild clinical lead poisoning. Values of from 0.2 to 1.0 mg. are abnormal and indicate clinical lead poisoning or convalescence therefrom. The majority of subjects studied showed values for the blood lead of from 0.2 to 0.5 mg. per hundred cubic centimeters.

It was found that in the absence of additional exposure clinical symptoms disappear before the blood lead content falls below an abnormally high level. Abnormal values for the blood lead may persist as long as one year after exposure, especially in children. There was no parallelism between the level of the blood lead and the severity of the symptoms.

LYTTLE, New York.

A CASE OF LEAD POISONING IN AN INFANT OF 4 MONTHS. A. STOOP, Arch. de méd. d. enf. **38**:99 (Feb.) 1935.

At the age of 2½ months the nursling began to vomit immediately after feeding; as soon as the stomach was emptied it was entirely comfortable. The mother's milk supply was markedly diminished through anxiety and loss of sleep, so a complementary feeding with a farina-sugar mixture was introduced, and for a short time the vomiting ceased, only to return with increased violence. A change of climate was made, without benefit. In the fifth week the baby suffered a severe convulsion, and the attacks of vomiting became almost incessant, with corresponding loss of weight; in three days the weight was reduced 300 Gm. At this time, six weeks after the onset, the patient was admitted to the author's clinic.

Except for extreme pallor and emaciation, physical examination revealed nothing abnormal; spinal puncture, however, showed greatly increased pressure, with a positive Pandy reaction. Pylorospasm was readily excluded through absence of the typical peristaltic waves after ingestion of food and of the characteristic explosive vomiting. Encephalitis was considered on account of the increased spinal fluid pressure with a low cell count, but the diagnosis was waived in the absence of fever throughout the course of the disease. During an intensive interrogation of the mother it was revealed that, seven weeks before, she suffered from fissured nipples and had used Goulard's solution as a therapeutic lotion since that time. This preparation consists of lead subacetate, 1 part; alcohol, 4 parts, and water, 45 parts, and is difficult to remove with warm water, with which the mother cleansed the breasts before nursing. This declaration furnished a clue to the intoxication, and subsequent examination of the blood showed the usual basophilic granulations. Roentgenographic studies confirmed the diagnosis; the distal diaphyses of the radius and the cubitus as well as the ends of the metacarpal bones and phalanges showed the typical shadows.

AMESSE, Denver.

FATAL INTOXICATION FROM EMETINE IN A CHILD. C. SARROUY, Paris méd. **1**:128 (Feb. 9) 1935.

A girl, 3 years of age, contracted amebic dysentery while in Algeria. Four days after the development of symptoms treatment with emetine hydrochloride was started. During four days she received 0.1 Gm. subcutaneously. She became markedly prostrated and could scarcely move. There were diminution of the tendon reflexes, muscular hypotonia and difficulty in speech and deglutition. Salivation was marked. The asthenia became more marked; the heart beat was rapid and

irregular and respiration irregular. The child died five days after the treatment with emetine was started. Other children who received the same dose showed no signs of intoxication; camphor in oil helps to counteract the depressant effects of emetine.

LESLIE, Evanston, Ill.

NITROBENZENE POISONING IN THE INFANT. PEDRO ARAYA CHIAPPA, Arch. Hosp. de Niños Roberto del Rio **5**:50 (March) 1935.

The author reports two cases of nitrobenzene poisoning: that of an infant 2 months of age and that of an infant 3 months of age.

In the first case the attack followed the ingestion of adulterated almond oil; in the other case it was due to the use of dusting powder containing nitrobenzene.

Intense cyanosis with complete absence of acute pathologic changes in the respiratory tract is characteristic of this form of poisoning. The prognosis is generally good if exposure to the dye is immediately discontinued. There is no specific therapy.

SCHLUTZ, Chicago.

HISTAMINE IN CHILDREN. GUSTAV PAPP, Wien. klin. Wchnschr. **48**:107 (Jan. 25) 1935.

Papp states that the normal dose of histamine (from 0.25 to 0.5 mg.) produces varying degrees of redness of the skin in children, mainly on the face and at the site of injection. Often there are elevation of temperature, headache and tremor. The formation of gastric juice is always markedly increased. Histamine does not affect the pulse or the blood pressure. Of the symptoms mentioned, the redness of the skin may persist at the point of injection of an extract of the posterior lobe of the hypophysis and be only slightly influenced by the injection of epinephrine and dextrose. Solutions of sodium phosphate, sodium carbonate and calcium have little influence. Though the formation of gastric juice is not affected by any of these preparations, a solution of sodium hydrocarbonate seems to favor such formation.

ABT, Chicago.

SECONDARY DEFICIENCY AS CAUSE OF DISEASES. J. GROEN, Nederl. tijdschr. v. geneesk. **79**:2505 (May 25) 1935.

Diseases analogous to deficiency diseases can rise when adequate food is not sufficiently digested and absorbed by the body on account of deficiencies in the intestinal tract. These are the secondary or conditional deficiency diseases of Castle. Pernicious anemia and other forms of anemia, certain disturbances of the tongue and nails and other conditions belong to this category. Rickets, defects of the teeth, osteomalacia and tetany may also originate from the intestine. Analogous syndromes of deficiency may arise in consequence of pregnancy because of the requirements of the fetus. In chronic diseases of the liver, especially in cirrhosis, symptoms of deficiency may also occur, caused by insufficient function of the liver as regards the accumulation of vitamins and other important food substances. In treating all these conditions a large supply of the deficient factors must be given to repair the damages caused by bad resorption and other conditions.

VAN CREVELD, Amsterdam, Netherlands.

Society Transactions

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Dec. 12, 1935

BÉLA SCHICK, M.D., *Chairman*

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NATURE OF THE CONSTITUTIONAL HEMOLYTIC ANEMIAS. DR. THOMAS B. COOLEY, Detroit.

Hemolytic icterus, sickle cell anemia and erythroblastic anemia are grouped together because of the striking characteristics which they have in common. They are obviously "constitutional" by reason of their racial, hereditary and familial incidence. They are hemolytic in that excessive destruction of erythrocytes is important in all three, though the types of hemolysis are not all the same. In hemolytic icterus the destruction takes place apparently in the spleen, because of some peculiar activity of that organ conveniently denominated hypersplenism; in sickle cell anemia fragmentation in the circulation and phagocytosis of erythrocytes both play a part, while in erythroblastic anemia excessive fragmentation seems to be the chief process.

As striking peculiarities in erythrocyte structure are observed in all three diseases and are believed to be a possible explanation of the red cells' susceptibility to hemolysis, known facts and theories regarding the normal structure of the red cell are briefly sketched. The normal biconcave disk shape is maintained by some peculiar property of the limiting membrane. This membrane is probably largely protein and is extremely thin. It may contain a part of the cell lipids, either deposited in the meshes of a loose protein network or spread over the outer surface. Such a lipid layer would have colloid properties, varying with the relative proportions of cholesterol and the phospholipids. The interior of the cell is composed of hemoglobin, some other protein, salts, water and various lipids, which probably are loosely united in a gelatinous mass to form the "stroma." The function of the lipids is not definitely known and has been the subject of much theorizing. It is frequently suggested that they have something to do with resistance to hemolysis and that this property may vary with the relative proportions of the different lipids.

Erythroblastosis foetalis is not, strictly speaking, one of this group of anemias, but is mentioned here because hypersplenism similar to that occurring in hemolytic icterus seems to play a part in its pathogenesis. It is suggested that in infants with this hereditary trait the abnormal activity of the spleen with resulting hemolysis is called into play by congenital polycythemia and the circulatory changes occurring at birth. A proof of the spleen's part is seen in the cure of the condition by splenectomy.

Hemolytic icterus is characterized by red cells which are called microcytes because their average diameter is less than the normal. They are globular and have more than normal volume. They are peculiar also in having an increased susceptibility to hemolysis by hypotonic solutions. The cure of the condition by splenectomy indicates that the spleen is the destructive agent, though just how the hemolysis occurs is not known. The tendency toward a return to normal in the diameter and resistance of the cell after splenectomy is a basis for the belief that the spleen and marrow must have a reciprocal relationship in the causation of the process.

In sickle cell anemia the red cells tend to take on the crescent shape under conditions of anoxemia. The structural peculiarity which allows this probably resides in the membrane. Destruction occurs by fragmentation in the circulation and by phagocytosis in the spleen and other depots of reticulo-endothelium. The cells destroyed are in the round form. There is no reason to suppose that sickling is a preparation for destruction. The effect of splenectomy on the anemic process is so slight that the spleen cannot be supposed to play a major part in the pathogenesis.

In erythroblastic anemia the red cells exhibit striking peculiarities under the microscope. Some of them are very large; many are of irregular shape, and a great proportion show imperfect staining which indicates an uneven deposition of hemoglobin. All stages of cell development are to be seen in the peripheral blood, and the staining peculiarities are as marked in the young as in the mature cells. The only definite effect of splenectomy is the great increase in the proportion of normoblasts.

In the belief that abnormal cell structure is a probable factor in the hemolysis in these disorders and that the abnormalities must be due to variations in the chemical or the physicochemical composition, a study of the structure of the red cells has been undertaken by the research laboratory of the Children's Fund of Michigan in collaboration with the clinic of the Children's Hospital of Michigan, Detroit. So far, the chief attention has been given to the lipids. The results do not as yet justify definite conclusions, but some interesting facts have appeared. The pattern of the distribution of the lipids in the red cells of normal children is remarkably constant and shows little relation to that of the distribution of the lipids of the plasma. In all three of the disorders under discussion variations from the normal distribution of the lipids have been observed. In hemolytic icterus and sickle cell anemia the changes have been in the form of a slight general increase in the lipid content of the cell, while in erythroblastic anemia there have been both a considerable increase in the total lipid content and a change in the proportions, notably a complete absence of cholesterol esters and a striking increase in neutral fats. An interesting observation is that in hemolytic icterus and sickle cell anemia the individual cells have more than the normal weight, while in erythroblastic anemia they are very light. Studies of the other constituents of the red cell are now under way.

The many resemblances between these diseases suggest a relationship in the fundamental etiology. The possible causes are: (1) Congenital peculiarities in the marrow. It is unlikely that these are the cause, as there are many reasons for believing that the observed changes in the marrow are merely secondary to the demand for new cells. (2) General disorders of reticulo-endothelium. This is an attractive hypothesis which might fit the cases of sickle cell anemia and erythroblastic anemia but not those of hemolytic icterus. (3) Disorders of metabolism, including endocrine conditions. The known facts regarding all the diseases could be fitted better to this theory than to either of the others, and at present this seems the most plausible working hypothesis.

DISCUSSION

DR. ERIC PONDER: I have been listening with great interest to Dr. Cooley's paper, and I think that the best way in which I can contribute to the discussion is to make a few remarks about the structure of the mammalian red cell and to follow these with a few observations on crenation and the maintenance of the normal shape of the cell.

It is now generally recognized that the red cell is a balloon-like body with fluid contents, surrounded by a relatively thick surface "envelope" which can be stained and seen under the microscope. By electrical methods it can be shown that there is some layer in the envelope which is completely nonconducting, and the same methods allow one to form an estimate of the thickness of this highly nonconductive and semipermeable region, which is usually referred to as the

membrane, in order to distinguish it from the envelope of which it is a part. The membrane is about 2 molecules thick, or about 0.003 micron, and even admitting that the estimate may be wrong by a factor of 10 or so, it is clear that the nonconducting and semipermeable properties of the cell are confined to a small region at or near its surface. Some regard the semipermeable layer as a bimolecular layer on the surface of the cell, while others think of it as a layer in the substance of the thicker envelope; the essential point about it is, however, that it is very thin and relatively unsubstantial. A breakdown of this membrane results in permeability to hemoglobin; i. e., hemolysis takes place.

The inside of the red cell seems to be a fluid of about the viscosity of olive oil, and there is no evidence that there is any "dense supporting stroma," as was once believed. One should remember, however, that the red cell is more complex than a bag containing hemoglobin in solution; it has a metabolism much like that of other cells but on a smaller scale.

The peculiar biconcave shape of the red cell is difficult to explain, and there have been many theories to account for it. One of these hypothesizes a substantial internal structure which maintains the discoid shape, but the existence of such a structure is not generally admitted. Another theory accounts for the special shape in terms of forces operating at the surface of the cell and points to the resemblance in shape between the "myelin forms" seen when droplets of lecithin are emulsified in water and the mammalian erythrocyte, the surface of which probably contains lecithin in conjunction with cholesterol and protein. Still another theory supposes that the molecules of hemoglobin in the interior of the cell repel each other more in one direction than in another, and this suggestion has been modified by supposing that the surface of the cell has a "liquid crystal" structure, greater molecular repulsion taking place in one plane than in another. None of these hypotheses is altogether satisfactory and it can be safely said that the reason for the special shape of the erythrocyte is wrapped in obscurity at the present time.

One point, however, should be emphasized: The shape of the red cell is much less constant than is generally supposed. Even in apparently normal persons it is far from uncommon to find the cells considerably crenated within the short time necessary to make up a wet preparation, and the amount of crenation varies from person to person. I know some persons whose red cells will scarcely crenate at all and others whose cells crenate so rapidly that one cannot secure a decent preparation, however quickly and carefully one works. Indeed, in some persons the red cells show such rapid and extreme crenation on withdrawal from the body that one cannot even make a presentable dried film. The variations as regards crenation are still greater if one turns from man to the other mammals; the cells of the sheep or the guinea-pig, for instance, will scarcely crenate at all, while the cells of the apes and of the rodents crenate as readily as do those of man. Why these changes in shape occur spontaneously in man and animals is unknown, but one cannot help feeling that if a little more were known about them one might be on surer ground when one came to speculate on such pathologic changes in shape as are noted in sickle cell anemia. So far as I know, they have never been systematically investigated.

In many respects the change in the shape of the red cell which constitutes sickling is similar to that observed in extreme crenation, for in both instances the cells are of normal shape when in the blood stream and assume their bizarre appearance only after standing. I am not aware that crenation, like sickling, is prevented by the presence of oxygen, but it is stated to be prevented by a high tension of carbon dioxide, and the extent to which sickling occurs is stated to be influenced by the carbon dioxide tension also. In many cases of sickle cell anemia, moreover, typical sickling is combined with what the physiologist would recognize as typical crenation, the result being the oat-shaped and holly-shaped cells which Dr. Cooley has described. I do not mean to give the impression that sickling is necessarily more than superficially similar to the crenation which occurs in non-pathologic bloods; I think, however, that it ought to be pointed out that the changes in the shape of the red cell constitute a large field which has yet to be

explored experimentally, containing everything from the familiar moderate crenation to sickling and the most extreme poikilocytosis.

DR. CARL H. SMITH: In order to understand the fundamental basis of the hemolytic anemias that have been discussed it is necessary to inquire into the physiologic mechanisms by which the red cell is ordinarily destroyed. As has been pointed out, phagocytosis and fragmentation are regarded as the only known natural processes by which erythrocytic disintegration is effected, and they must be distinguished from hemolysis in which free hemoglobin is introduced into the circulation, which is an extremely unusual occurrence.

While phagocytosis is a normal method of erythrocytic destruction, it is observed only infrequently in the peripheral blood. Fragmentation, however, may be more readily visualized. Doan and Sabin have described this process during the course of examination of fresh blood smears by means of the supravital technic. From the surface of the erythrocyte a projection appears; this becomes more noticeable, and the red cell assumes the shape of a poikilocyte. This projection subsequently develops into a rod, which eventually breaks off from the red cell. In varying degree this process of fragmentation may be observed in all blood smears. Dr. Cooley several years ago reported cases of blood dyscrasias in which fragmentation was carried to such an abnormal degree that this mechanism was suggested as an important factor in the pathogenesis.

I have been interested for many years in examining the fresh blood of infants and children by means of the supravital technic. Probably this affords the nearest practical approach to the examination of living blood cells. A definite though slight degree of fragmentation was observed in all the blood smears examined in this way. Although increased fragmentation was not a prominent feature in the red cells of all children with severe anemia, in some blood smears fragmentation proceeded at an excessive rate, and one could observe the marked shedding of portions of the red cell until the latter appeared microcytic. The individual cellular fragments seemed to possess portions of the wall of the red cell. It was also noted that the response of the red cells to hypotonic saline solution was not indicative of the degree of cellular destruction that occurred in the peripheral blood. In a rather crude attempt to simulate the effect on the red cells of the constant wear and tear in the course of the circulation, specimens of blood from a few children with severe anemia were subjected to high speeds of centrifugation. At the end of from one-half to one hour, the cellular sediment was resuspended in the supernatant plasma, and a drop of blood was examined by the supravital method. The erythrocytes were intact, and in many instances the leukocytes resumed their original motility. It was interesting that the rate of fragmentation was not altered in any case as a result of this procedure. Although no conclusions can be drawn from such casual observations, they are suggestive of the interplay of fundamental processes. It is conceivable that in the so-called hemolytic anemias discussed tonight one is dealing with a two-fold phenomenon. In the first place, there seems to occur in this group of diseases a disturbance of the normal regulatory processes or equilibrium whereby cellular disintegration is kept in check. Second, the red cells in some of these conditions possess an inherent tendency to increased disintegration, which becomes manifest when the regulatory mechanism has been disturbed. The individual capacities for fragmentation are, however, apparently not readily accelerated by physical trauma. Perhaps the plasma plays some part also, as is suggested by the observation of Josephs that erythrocytes in sickle cell anemia lose their sickling property after repeated washing with saline solution and that it is restored by exposing the washed cells to normal serum. I hope that Dr. Cooley's researches will throw some light on the chemical and physical processes that may explain some of these observations.

I should like to mention one more point: In many reported cases of erythroblastic anemia an increased percentage of monocytes has been noted. I have observed this and, in addition, that in several instances erythrocytic fragments appeared in the cytoplasm of these cells. An increase of monocytes in the hemolytic anemias may perhaps be related to abnormal erythrocytic destruction.

DR. KENNETH MCALPIN: When invited to discuss this paper I immediately thought of the old darkey who, when asked to change a ten dollar bill, replied: "Ah cain't, but Ah appreciates de compliment!"

I, too, appreciated the compliment.

My sensations tonight have been unique. I have felt like a child at the circus or the cinema for the first time, seeing and hearing such astonishing facts—facts about my old friends, the red blood cells. I have known these cells for years, but tonight they have been presented in a new and impressive way. The old stained blood smear is becoming obsolete. It will, of course, continue to be valuable as a method of study, but the erythrocytes are now considered in an altogether different way, as has been so well brought out by Dr. Cooley and Dr. Ponder.

The hands of the clock move rapidly, and I shall encroach on your time only long enough to mention my delight at having recently seen a brand-new toy, one which I hope Santa will put in my stocking. I refer to the micromanipulator. With this surprisingly delicate instrument a skilled operator can dissect a living red blood cell as readily as he can the muscles of the hand. This is one of the refined methods of studying the living cell which is a great help in observing the spherical erythrocyte of hemolytic icterus and similar conditions.

DR. PAUL REZNIKOFF: Dr. Cooley and Dr. Ponder have presented many interesting points, and I am sorry that the members have not time enough to ask them all the questions they should like to ask.

It seems to me that it is not remarkable that hemolysis occurs occasionally; the striking thing is that it does not occur much more frequently, when one considers the trauma of circulation and respiration. This indicates a marked solidity of the red blood cells. It is also remarkable that new-born infants do not suffer from more abnormalities of the red blood cells, when one remembers the rapid changes in prenatal and postnatal life. Wintrobe has shown that the fetus before birth has a macrocytic condition of the blood. It is possible that if there were sufficiently accurate measurements more abnormalities would be discerned.

If red blood cells are treated with a lead salt the same phenomena are obtained that Dr. Ponder spoke of: first, crenation and then shrinking, so that the red blood cell becomes a small round disk measuring not more than 4 or 5 microns. If these cells are shaken they traumatize easily, indicating that they are more fragile than normal cells. They are, surprisingly, more resistant to hypotonic solution. This substantiates the statement made by one of our speakers that the test with hypotonic solution carried out in vitro is not a measure of the fragility, certainly not a measure of the fragility as it occurs in the body in hemolytic conditions.

It might interest Dr. Ponder to know that this phenomenon is seen in man, the rabbit, the guinea-pig and the rat but does not occur in the cat, the dog or the horse.

Recently Dr. Hutton, of the New York Post-Graduate Medical School and Hospital, reported a case which is of great interest in relation to hemolytic anemia. This condition occurs frequently in southern Italy, Sicily and Sardinia. Only 2 cases have been reported in this country. It is caused by the fava bean. Apparently the first ingestion of the green bean or the inhalation of the pollen causes no symptoms or signs, but these may, as much as a year later, produce the most profound hemolytic anemia with hemoglobinuria. In Sardinia the mortality rate has been as high as 8 per cent. It is clear that this condition is not due to the toxic effect of the bean, nor is it allergic in the strict sense of the word. It is apparently an anaphylactic condition. It would be interesting to remove the spleen of animals before and after the first dose of the offending protein. Perhaps such an experiment would throw light on the site of formation of hemolysins. I understand that in the past the fava bean was introduced in this country in a dried form and that the dried or cooked bean was not responsible for this type of anemia, but since it is now being grown in this country and some persons eat it raw more cases of this type may be seen.

I know that Dr. McAlpin has a much greater grasp of this subject than he admits in his modesty. I wonder whether he was referring to the new microdissection apparatus. If lipoid-solvent or lipoid-miscible material is placed against the surface membrane or the plasmalemma of a cell like an ameba it is striking to see the disappearance of the surface at the site of the application of the pipet. A cell like the ameba can usually reform its surface. However, if one introduces this material against the surface of a red blood cell or traumatizes the surface with a needle it is remarkable to see how this protected layer of the red blood cell disappears and the cell is destroyed. It seems from such work as Dr. Robert Chambers has done that this lipoid material, which may be only from 2 to 20 molecules thick, as was indicated by Dr. Ponder, is nevertheless an important factor in maintaining the integrity of the red blood cell.

DR. HARRY M. GREENWALD: I can contribute only a few practical clinical points to this discussion. First, it should be emphasized that not every patient with icterus gravis shows erythroblastosis. This was demonstrated by Hawksley and Lightwood in their monograph on icterus gravis and by me in 1926.

Nor is erythroblastosis present in every case of anemia in the new-born. There are apparently two types of congenital anemia in the new-born. One type is associated with erythroblastosis foetalis; the patients show increased hemolysis and jaundice and many respond to transfusion. In patients with this type extramedullary foci of hematopoiesis are present. The second type of congenital anemia may be equally severe, but there is no erythroblastosis, and no extramedullary foci of hematopoiesis are present in the liver, spleen or kidneys. Cases of such conditions have been reported by Brown and his co-workers, by Cohen and by Pasachoff and Wilson. Dr. Cooley has recommended splenectomy for the cure of erythroblastosis foetalis and has had it done in three of his cases.

A word as to hemolytic icterus: This is a rather uncommon disease in this country; it is seen with much greater frequency in Germany. Dr. Cooley pointed to the possibility of two etiologic factors, one a constitutional factor and the second hypersplenism. I am heartily in accord with this point of view, since it has been observed that the blood of other members of the patient's family, who were apparently perfectly well, showed microcytes and decreased resistance of the red cells to hypotonic saline solution. It has also been observed that not infrequently after splenectomy, although marked clinical improvement occurred, there was persistence of the increased fragility of the red blood cells, and large numbers of microcytes were still present in the patient's blood. In other words, apparently a constitutional factor is responsible for the production of abnormal cells which lend themselves readily to hemolysis, but hypersplenism is necessary for the occurrence of hemolysis. However, as Dr. Cooley has pointed out, the immediate cause of the crises is still unknown.

The question of splenectomy should receive some consideration. It should be emphasized that, while splenectomy is undoubtedly the best method of treatment for hemolytic icterus, there are cases in which this procedure does not bring about the desired result. There are at least 20 cases on record in which a recurrence of symptoms was observed after splenectomy, even in the absence of accessory spleens. Two of these cases were reported only recently by Dr. Freund, from Dr. Schick's clinic. In both cases the liver and the reticulo-endothelium of the lymph glands took on the function of the extirpated spleen, with the production of serious crises and a fatal outcome. Nor should all patients have splenectomy done. When the crises are severe, with the production of severe anemia, so that the patient's life is endangered, or when the patient becomes debilitated by the disease, splenectomy should be done. In many instances the patient merely has mild anemia and slight jaundice. Such patients require no operative intervention. Doan recently made the statement that the spleen controls bone marrow function. I studied the bone marrow in 5 cases of thrombocytopenic purpura and noted an absence of megakaryocytes. Splenectomy was done in 3 of these cases, and 2 of the patients died of cerebral hemorrhage. Studies of the bone marrow after splenectomy failed to show the presence of megakaryocytes. Even though splenec-

tomy may relieve or cure the disease, one cannot conclude that the good results obtained are due to the removal of the inhibitory action of the spleen on the bone marrow.

There is a type of anemia which Dr. Cooley did not mention and which I think is well known to the members but which deserves some emphasis. This is the type of acute hemolytic anemia which was first described by Lederer and later by Parsons and his co-workers. This type of anemia is remarkable for the sudden hemolysis that takes place, with tremendous changes in the blood picture within a few hours. Thus, I saw a child who was admitted to the hospital with a red cell count of 4,000,000 and a hemoglobin content of 85 per cent. In twelve hours the red cell count was reduced to 800,000 and the hemoglobin content to 20 per cent. In this condition the icteric index is high; the nonprotein nitrogen content of the blood is high (from 68 to 90 mg. per hundred cubic centimeters); hemoglobinuria is present, and the reticulocyte count may be as high as 40 per cent. Another remarkable fact is the effect of transfusion in these cases. The patient who looks moribund before transfusion is apparently on the road to recovery several hours after the transfusion, and the vomiting, the restlessness, the air hunger and the abdominal pain disappear in a short time. The etiology of this disease is obscure. It has been pointed out that it may have some relationship to hemolytic icterus. There is one marked difference, however, which cannot be ignored; this is that, although transfusions are without effect or may even prove dangerous in hemolytic icterus, they are absolutely specific in the cure of hemolytic anemia. One transfusion usually suffices. Just how the transfusion acts is still a mystery; apparently it neutralizes the hemolytic factor, whatever the source.

Finally, I wish to point out that Dr. Cooley has contributed a great deal to the study of hemolytic anemias in children. Particularly noteworthy is his study of the lipid content of the red cell in erythroblastic anemia, sickle cell anemia and hemolytic icterus. He is also responsible for the classification of a large group of conditions which are called Cooley's anemia but which he, because of his modesty, prefers to call Mediterranean anemia.

DR. MARGIT FREUND: I wish to limit my remarks to the familial erythroblastic, in short, Cooley's, anemia.

In the last five years my associates and I have observed 4 cases. All the patients were Italian children, the oldest being 2 years old. They had the typical familial history and clinical features. Only 1 of these cases was problematic in that the patient did not show the characteristic skeletal lesions, although numerous roentgen examinations were made over a long period. In all other respects this case was typical. The patient was the third child of an Italian family afflicted with severe anemia. I wonder whether Dr. Cooley would accept this case as an instance of this type of anemia, in spite of the absence of osseous changes.

Three patients came to autopsy, 2 of them after Dr. Whipple and Dr. Bradford published their observations on the conspicuous pigmentary findings. In these cases the most careful studies of pigment were made in the pathologic department of the Mount Sinai Hospital, but the observations did not correspond to those of Dr. Whipple. Did Dr. Cooley corroborate the striking pigmentary changes?

It is peculiar that it has been many years since a patient came under our observation with a diagnosis of von Jaksch's anemia. It is clear to us that severe nutritional anemias and anemias connected with rickets are not so frequently seen as in former years, owing to the better understanding and successful prevention of this disease. But how is it that in the great number of Irish, Jewish and Puerto Rican children one never sees a clinical picture similar to that of Cooley's anemia? It seems that of the varied conditions diagnosed in previous years as von Jaksch's anemia, only Cooley's anemia stands as a definite entity.

DR. THOMAS B. COOLEY: The changes in the skull and long bones are often not marked enough to show definitely on roentgen examination. The most pronounced changes in the skull that my associates and I have seen in erythroblastic

anemia did not appear until the patient was 8 or 9 years old. As to the distribution of pigment, the observations reported by Whipple were remarkable, but it is by no means true that a similar picture will be found in every case. Further studies are needed. The decline in the number of cases of von Jaksch's anemia is interesting. I think that it is the result of more discriminating diagnosis. There is a condition which might well be called von Jaksch's syndrome—subchronic secondary hemolytic anemia which tends to recovery.

Three successful splenectomies for erythroblastosis have been reported, which seem important as indicating the rôle of hypersplenism in the pathogenesis.

A Case of Congenital Valvular Obstruction. Dr. J. Sydney Ritter, Attending Urologist, Midtown Hospital, and Dr. Leo A. Shifrin, Assistant Attending Urologist, Midtown Hospital.

In 1933, we were asked by Dr. Dowd to see a boy, 13 years of age, who was propped up in bed because of embarrassed respiration and distention of the abdomen to three times the normal size.

At the age of 7 years the patient had had symptoms of respiratory disease and was treated for asthma. From that time on his abdomen slowly increased in size up to the time of admission. As pyuria was present, a complete urologic study was made.

In a flat roentgenogram the psoas muscles could not be visualized, and there was no evidence of either kidney. There was marked flaring of the ribs. The roentgenogram of the body covered an entire 14 by 17 inch (35.6 by 43.2 cm.) x-ray film.

An intravenous urographic study was then thought advisable in an attempt to outline the urologic tract. However, after three hours there was no evidence of dye in either renal area or in the bladder. On palpation several large masses were felt in the abdomen, one in the region of each kidney, several small ones throughout the abdomen and one large mass, pyriform in shape, extending from the region of the umbilicus down to and behind the symphysis pubis. This we took to be an overdistended bladder. By catherization we removed 10 ounces (283.5 cc.) of urine and stopped because it was thought inadvisable to remove more. We replaced the drained urine with a 10 per cent solution of sodium iodide, removed 10 ounces more of the contents of the bladder and replaced this also with a 10 per cent solution of sodium iodide. A roentgenogram was then taken, which showed the bladder distended to the third lumbar vertebra. At this time gradual decompression was instituted. For this we employed a simple eye-dropper, puncturing the rubber bulb with a red-hot needle and thus producing a perforated plug that permitted slow emptying of the bladder. It took almost four days to complete the decompression. As the bladder decreased in size the abdominal masses disappeared. The respiratory embarrassment abated.

After one month of drainage by catheterization a second roentgenogram was taken after the bladder was distended with solution of sodium iodide. This demonstrated a much smaller bladder with a large sacculation. The psoas muscles were visible, and the kidneys could now be visualized.

The urea nitrogen content in this child dropped from 47 to 23 per cent with the drainage of the bladder, although there was only 5 per cent excretion of phenolphthalein after a three hour estimation. The patient showed symptoms referable to possible infection, and to avoid further complications the urethral catheter was removed and suprapubic cystotomy performed.

Three months after the cystotomy a cystogram was taken through the suprapubic tube. This showed the bladder contracted to within normal limits for a child of this age, and the normal landmarks were evident. The psoas muscles and the kidneys were better visualized, and the abdomen had returned to its normal contour.

Because of the patient's cardiac condition and the additional danger due to the damaged kidneys further surgical intervention was not performed. Death

occurred about one and a half years after the patient's admission to the Midtown Hospital, due to cardiac disease.

A specimen demonstrates bilateral valves of the posterior part of the urethra causing dilatation of the posterior part of the urethra, the internal part of the sphincter and the bladder, bilateral hydro-ureters and bilateral hydronephrosis. To summarize:

A case of congenital valvular obstruction without urinary symptoms is reported. Early recognition would have prolonged life. Minor transurethral surgical intervention is indicated in such cases. All children having congenital obstruction should have an intravenous urogram taken.

DISCUSSION

Dr. Heman Laurence Dowd: This case is of extraordinary interest from the medical angle because when the patient was admitted to the hospital he had an enlarged abdomen and three peculiar masses. Colonic irrigations reduced the size somewhat. The blood chemistry and the results of urinalysis showed need of further investigation. I wish to congratulate Dr. Ritter on his able handling of the case. He kept the patient alive for a year and a half.

It is extraordinary that a mechanical obstruction could initiate such a pathologic condition and lead to the death of the patient.

When the patient was admitted with a diagnosis of asthma he had a large heart with severe decompensation. Digitalization was ineffective. The original treatment of the bladder helped. I question whether his life would have been saved if the condition could have been diagnosed earlier.

I talked to Dr. Meredith Campbell about this case. He has observed 64 cases of valvular obstruction of the urethra, and in one half of them there was serious cardiac or renal damage. One patient, a boy of 12 months, had the bladder of an old man and a large heart. He died six weeks after he was first seen.

Dr. Ritter has reported a very interesting case.

Program Contributed by the Pediatric Service of Bellevue Hospital

Jan. 9, 1936

Béla Schick, M.D., *Chairman*

Alexander T. Martin, M.D., *Secretary*

Public Health in a Private Day School. Dr. Lucy Porter Sutton.

The health service in a private day school for girls in New York City is described. The purpose of such a service is to learn the physical status of each pupil, to take appropriate measures to build up and maintain each child's optimum state of health and to control the spread of contagious diseases. The school is interested in such service primarily because it wants good educable material.

Five requirements are fundamental:

1. A school administration with sufficient breadth of vision to cooperate with any intelligent plan reasonably presented by the school physician.

2. A school physician who is a pediatrician actively interested in the health aspects, collectively and individually, of child life.

3. An intelligent trained nurse to assist the physician, to do first aid work and to keep detailed records.

4. The cooperation of the department of physical education. Since recreation and exercise when rationally carried out add definitely to the health of children,

the work of the department of physicial education is inseparable from the phases which occupy the attention of the physician and the nurse.

5. The cooperation of the family and its physician. According to a state law, the school requires a certificate of vaccination against smallpox. It also endeavors to see that all children have a negative Schick reaction. At present 85 per cent are known to be immune to diphtheria.

The instructors of physical education do excellent work in training the girls in body mechanics.

All the employees of the school who handle food in any way are examined yearly by the school physician.

The girls in the school are in general well cared for, but about 25 per cent each year are found to have some deviation from the normal not previously known to the family. The most frequent finding is visual difficulty. Occasionally a serious defect is found. About 4 per cent of the 385 girls are malnourished. Any defects found are reported to the parents, who are asked to take the child to their physician for confirmation of the findings. The function of the school physician does not include treatment or advice as to treatment. His responsibility ends when he calls any matter to the attention of the family, and it is taken up by the family's physician.

The common cold is the greatest single cause of absenteeism. No child is allowed in school during the first three days of a cold, and teachers with a cold who are in close contact with the children are expected to stay at home for the same period.

Contagious diseases are handled according to the scheme worked out by a school physicians' association. Girls exposed at school are examined before classes by the school physician during the dangerous period and are sent home at the slightest signs arousing suspicion, including a temperature of over 99 F. The cases in which the disease develops after exposure to a pupil at the school are kept down to the minimum percentage expected. Thousands of school days are saved each year by following this scheme.

The percentage of total absenteeism remains remarkably constant from year to year, in spite of considerable variations in the incidence of contagious diseases.

A school and its physician are in a position to do a great deal for the health of children collectively and as individuals. The school health program should be an important factor in educating parents to demand that pediatricians help their children to attain and maintain an optimum state of health rather than merely to treat them during acute illnesses.

TREATMENT OF GONORRHEAL VAGINITIS IN CHILDREN. DR. ELEANOR L. ADLER.

The employment of estrogenic substance in the treatment of gonorrheal vaginitis in children was introduced by Dr. Robert M. Lewis in 1933. This treatment is based on the marked hyperplasia of the vaginal mucosa resulting from the action of estrogenic substance. The same reaction had been shown by Allen in immature monkeys. The rationale of this method of treatment is the development of a vaginal mucosa consisting of many layers of vacuolated and cornified epithelial cells which is resistant to the gonococcus and, further, the formation of an acid vaginal secretion resulting from the breakdown of the proliferated epithelial cells, forming a medium in which the gonococcus will not thrive. It is this factor which is probably responsible for the elimination of the organisms and the subsequent cure. Retrogression of these changes in the tissues has been shown to occur within a few weeks after treatment has stopped, leaving no permanent changes.

An investigation has been carried on for the last two years in the Children's Medical Service at Bellevue Hospital, in which 165 cases of gonorrheal vaginitis were studied. The results for a small group of patients treated with instillations of a 20 per cent solution of mild protein silver supported the general impression that local antiseptics are not satisfactory in treating this condition, months of treatment being required for results.

Three groups of patients were treated with estrogenic substance (amniotin): 1. In those treated with hypodermic injections of a solution of estrogenic substance in ethylene glycol in doses of 50 and 100 rat units the results were disappointing. 2. In the patients treated with the same preparation in daily doses of 300 rat units the results were satisfactory, but this treatment is not practicable. 3. Of those treated with estrogenic substance in suppositories containing 75 rat units and 1,000 international units, 94 per cent showed negative findings in an average of twenty and six-tenths days.

Some patients who received large doses of estrogenic substance by hypodermic injection showed slight hypertrophy of the breasts, which rapidly subsided on cessation of the treatment. No untoward effects occurred in the patients treated with suppositories. Some recurrences developed in all the groups. In these cases the condition responded promptly to a second course of treatment.

Estrogenic substance given by suppositories was found to be the most effective method of treating gonorrheal vaginitis in children.

DISCUSSION

DR. ROBERT M. LEWIS, New Haven, Conn.: The results of treatment of gonorrheal vaginitis with estrogenic substance just reported by Dr. Adler are remarkably good. I know of no other method of treating these patients that is at all comparable in its effects.

Occasionally one finds persistent urethritis, endocervicitis or proctitis that prevents the patients from recovering unless special suitable local treatment is instituted. Dr. Adler also mentioned the type of case in which no extravaginal focus of infection is found but in which response to treatment with estrogenic substance is unsatisfactory. Fortunately, such cases are in the minority.

In a group of 200 or 300 cases which my associates and I have so far observed or reported no patient appeared to suffer any ill effect as the result of the treatment with estrogenic substance. Certainly the fetus before birth receives more estrogenic substance from the mother over a longer course of time than have these patients. At birth the pelvic organs and breast of normal babies show the same or greater changes than those resulting from extensive long continued treatments. In both instances (i. e., after birth or after treatment with estrogenic substance is withdrawn) one finds the same retrogression of the pelvic structures. I do not think, therefore, that one need concern oneself overmuch about the possible injurious results of therapy with estrogenic substance.

It has been recognized for a long time that the acidity of the adult vaginal secretions is hostile to gonococci. With estrogenic substance the glycogen-containing cells of the vagina are rapidly produced. As they break down, lactic acid and other acids are liberated. This production of acid is easily measured. Our results bear out the fact that as the vaginal secretions become acid (a p_H of from 6 to 4.4) the gonococci are no longer observed on smears and discharge ceases.

(Lantern slides were shown demonstrating the production of vaginal acidity as a result of the administration of estrogenic substance, with the disappearance of pus and gonococci.)

VALUE OF LATERAL AND ECCENTRIC ROENTGENOGRAMS OF THE CHEST. DR. CHARLES HENDEE SMITH.

Roentgenograms of the chest taken in the anteroposterior position obviously do not show the exact site of any lesion, since the projection of the shadow of any solid object requires a view from more than one direction to determine its true shape. Lateral views of the chest add greatly to information about pulmonary lesions, especially in pneumonia, fibrosis and tuberculosis. In the Children's Medical Service of Bellevue Hospital lateral views have been taken as a routine for several years. In pneumonia the consolidation is seen to begin along the fissures in most cases, often as a thin plaquelike area, sometimes extending to involve much of a lobe or lobes. The shape of the consolidated area suggests that the theory that a plugged bronchus determines the localization of pneumonia cannot be correct, since these thin plaque-shaped lesions are not distributed according

to areas supplied by any bronchus. Perhaps the greater resistance to expansion in the areas of lung in contact with the fissures may be a factor.

In fibrosis of the lung exact diagnosis of the involved lobes is important, and the lateral view is essential in differentiating overlapping lobes. In tuberculosis primary foci may lie in front of or behind the hilar shadow, and so the shadows are sometimes read as calcified tracheobronchial nodes. In some cases calcified nodes are obscured by the sternum in the anteroposterior view but may be visualized by the lateral view.

Retrocardiac lesions rarely show in the roentgenogram taken in the anteroposterior position. A technic for studying this region has been used at Bellevue Hospital for more than ten years. The film is placed behind the patient. The tube is in front and is moved 18 inches (45.7 cm.) to the left of the midline of the patient, at a distance of 3 feet (91.4 cm.). This throws the shadow of the heart to the right and exposes most of the lung lying behind the heart. This "eccentric" position is better than the usual oblique view, since in the latter the vertebral column obscures most of the left pulmonary field.

(Roentgenograms illustrating several cases were shown.)

CHICAGO PEDIATRIC SOCIETY

Regular Meeting, April 21, 1936

ABRAHAM LEVINSON, M.D., *President, in the Chair*

MASTITIS OF PUBERTY. DR. PHILLIP ROSENBLUM.

The mastitis of puberty, or mastitis adolescentium, is frequent in girls aged from 8 to 11 years and not infrequent in boys aged from 14 to 16 or 17 years.

This tumor-like enlargement of the breast was accurately described by Underwood more than one hundred years ago but since has received practically no mention in the pediatric literature.

There seems to be no unanimity of opinion in modern textbooks on pathology and surgery as to its exact nature. Because of the lay education in the field of cancer and allied subjects this more or less physiologic condition often causes considerable anxiety to parents.

The exact etiology is not known, though glandular dysfunction no doubt plays a rôle associated in some way with trauma. The swelling disappears in from a few weeks to several months. It usually involves one breast but may appear in both.

The swelling is due to a pericanalicular and periacinous infiltration with connective tissue, together with epithelial hyperplasia. It is not a true inflammation and always occurs in the same location, just behind the nipple. It should not be confused with other tumors which rarely occur in the breasts of children.

DISCUSSION

DR. JOSEPH BRENNEMANN: This is an interesting and timely paper. I have often, on seeing a condition of this sort, made an attempt to find something about it in the literature at hand, but could not find much. My associates and I have observed a great many of these cases, and the condition has occurred at about the same age period noted by Dr. Rosenblum. The breast is one of the sex organs and is susceptible to both endogenous and exogenous influences. Trauma may play a part. It is a bit hard to see how an influence from within could affect only one breast. Some of the members heard Dr. McCracken speak the other night, at which time he said that in Africa among the natives if a mother had no milk it was a common practice to call in a virgin or a grandmother to nurse the baby. He had the record of one authentic case of a man who nursed

a baby successfully for a period of five months. Other cases of this sort have been reported. I mention this as an illustration of what can happen to a breast that is stimulated either from without or from within; it may have some bearing on the present subject.

There is another condition in which the breast is enlarged, often markedly so, at a much earlier period. My associates and I observed a child 2½ years old with breasts that would do credit to an adult. I had another patient who had only one breast enlarged at the tenth month. In neither of these cases was there tenderness, and the condition had, of course, an entirely different etiology than that here described. It is again hard to explain why only one breast should be enlarged in the second instance that I have spoken of.

Dr. Arthur H. Parmelee: This paper refers to a condition a great many instances of which have been seen by all the members, and the subject should be of considerable interest. To me it is of special interest, because I have been interested in engorgement of the breast in the new-born. I think that the condition referred to by Dr. Rosenblum must be an endocrine disturbance, and the unilateral occurrence, as he has suggested, is probably due to trauma of some sort that has produced irritation in one breast and not the other.

Dr. Brennemann spoke of having seen enlargement of the breast in a 2½ year old child and in a child aged 10 months. I have records of some 15 children who showed continuous engorgement of the breast throughout the entire first year. This occurred only in girls, never in boys. In boys engorgement of the breast disappears rather quickly. However, it has been noted that after the engorgement of the breast and lactation have disappeared they can be made to return by stimulation of the breasts. The fact that these conditions ordinarily occur, in my experience, as in Dr. Rosenblum's, at about the eighth, ninth or tenth year, at a time when other preadolescent changes occur—changes in the figure, for example—would substantiate the idea that the condition is of endocrine origin, closely associated with the activity of certain sex hormones.

Dr. Philip Rosenblum: I wish to thank Dr. Brennemann and Dr. Parmelee for their discussion. I purposely avoided speaking of anything but the mastitis of puberty in order to clarify the condition. In looking through the literature I noted such difference of opinion that I thought it best to identify the condition. No two descriptions that I could find were the same. Gynecomastia, which is merely enlargement of the breast, is a different condition. In men of 60 or 70 years of age who have had prostatic operations enlargement of the breast often is noted, and following operations on tumors of the testes the breasts often enlarge. There are congenitally enlarged breasts, but the mastitis of puberty is a distinct condition, and it is strange that since Underwood's article many years ago no one has defined it in just the same way so that in this cancer-conscious age parents may not be needlessly alarmed.

Foreign Body Obstruction of the Main Bronchi in Children. Dr. Mandel L. Spivek.

The bronchi, in common with other conduction systems, maintain a unique position in the body in that slight obstruction, if opportunely placed, may cause a disproportionate change in the organ served. As in other systems, the ensuing disturbances, both early and late, can be predicted and, conversely, from a study of the history and the physical and roentgen findings, the point of obstruction can be accurately located. The ease with which this can be accomplished depends largely on the clinician's awareness of the important events in the history and his knowledge of the various patterns disclosed by physical examination and the roentgen rays.

Foreign bodies, as illustrated by the cases reported, may cause atelectasis by complete closure of the bronchus or emphysema by partial blocking. The immediate and late results of the action of such intruders are dependent on their structure, form and chemical substance. The diagnosis is frequently associated

with some difficulty either in establishing the actual presence of a foreign body in the tracheobronchial tree or in determining its place of lodgment. The history of inspiring a foreign body, absence or diminution of breath sounds over a pulmonary field, a wheeze and roentgen visualization of the foreign body or its effects are aids in the diagnosis. The migration of the obstructing mass from a physiologic safe place to a position where it can completely block the tidal flow of air is extremely dangerous and may end in the death of the child.

DISCUSSION

DR. JOSEPH BRENNEMANN: After a great many years, having run the gamut of most of the interesting conditions that one encounters in medicine, I can say today that there is nothing more fascinating than just the sort of condition that Dr. Spivek has been discussing. My associates and I have been much interested in the whole subject, and I know of nothing else except perhaps congenital atresia of the esophagus in which one can reason so well from anatomy to clinical findings and from clinical findings back to anatomy.

One is likely to think of foreign bodies as being the main object of bronchoscopy, but they represent not one-twentieth of the subject matter. The things that have interested us most and have occupied us most are the interplay of atelectasis and emphysema as a result of complete obstruction, on the one hand, and of partial obstruction or a compensatory action to overcome the effect of the atelectasis, on the other. We have been especially interested in cases of laryngotracheobronchitis in which there may be complete and fatal atelectasis or partial atelectasis with compensatory emphysema, the latter becoming finally so severe that the portion of the lung in which it occurs can no longer function properly. It is sometimes difficult to tell which is the dominant factor. It is in these cases that the hope lies in bronchoscopy and tracheotomy.

For work of this sort three things are necessary: first, a clinician. No good clinician ever looks at a roentgenogram or consults the bronchoscopist until he has carefully studied the patient and committed himself in writing as to the condition probably present. One can frequently make a definite anatomic diagnosis. My associates and I have had our interest tremendously stimulated by the work of Anspach, published several years ago, with which the members are doubtless familiar. The next important thing is the roentgenogram, in which one can frequently see the extent of atelectasis and of emphysema and especially the position of the heart. The third important thing is the bronchoscopist. In Chicago, as compared with Philadelphia, for example, there is no outstanding bronchoscopic clinic, nor is there any one who has devoted himself exclusively to bronchoscopy. For that reason it is a source of extreme gratification to know that there is now in Chicago a physician who devotes all his time to endoscopy and the larynx, a physician trained in Chevalier Jackson's clinic. It is still a constant surprise how many situations arise almost daily in which one feels that the services of a bronchoscopist who is at hand and glad to come at any time of day or night are indispensable.

DR. ABRAHAM LEVINSON: If I were not chairman of the meeting I would wax poetic over Dr. Brennemann's remarks, not only about his comments in regard to the relation of clinical medicine to pathology, but also about "reasoning" in medicine. I was glad to hear him say that clinical medicine is not a mechanical science but that it can make use of reasoning.

DR. MANDEL L. SPIVEK: I wish to thank the discussers and to thank Dr. Brennemann for his remarks.

As was stated in the body of the paper, it is necessary to secure a good history and it may be necessary to reinterrogate the parents on several occasions if the history does not seem to parallel the physical or roentgen findings.

I think that auscultation will frequently localize a foreign body with greater accuracy than a simple roentgenogram, especially if the observer does not see such roentgenograms frequently. The absence or diminution of breath and voice sounds points out the nonaerating parts.

These children frequently inspire more than one piece of nut. This is explainable by the very nature of the substance. The peanut is oily and does not form an adhesive whole but separates into various parts as it is chewed. The same holds true for coconut. When the child suddenly laughs or cries he inspires the various pieces of crushed nut. Often the fine particles are sprayed out into the small bronchi and bronchioles.

When a pin is concerned careful examination is essential. When these patients are examined fluoroscopically and by roentgenograms the entire respiratory tract, including the mouth and nasopharynx, are investigated. Foreign bodies in the larynx and pharynx for a long period cause the long continued irritative cough sometimes resembling whooping cough.

EVALUATION OF OXYGEN-CARBON DIOXIDE MIXTURES IN THE TREATMENT OF PNEUMONIA. DAVID J. COHN, PH.D. (by invitation).

This paper is an abstract of a series of articles on oxygen therapy by David J. Cohn, Albert Tannenbaum, A. Baird Hastings and William Thalhimer, which are being prepared for publication.

Carbon dioxide is a respiratory stimulant and is added to oxygen in the treatment of asphyxia, carbon monoxide poisoning and other conditions in which the respiratory centers are depressed. The addition of carbon dioxide to oxygen has also been advocated in the treatment of pneumonia. However, since in this disease there is no depression of respiration the advantage of the use of carbon dioxide appeared questionable unless it could be shown that it aided in overcoming anoxemia.

A series of experiments was therefore undertaken on dogs with induced bronchopneumonia and anoxemia, in which the relative degree of oxygenation of the blood was determined before and after the administration of oxygen alone and of oxygen in conjunction with carbon dioxide. Simultaneously, the acid-base balance of the blood was studied.

It was found that for complete oxygenation of the blood of anoxemic animals oxygen alone is all that is necessary. The addition of carbon dioxide has no effect in this respect.

On the other hand, whereas the acid-base balance of the blood remains normal in pneumonia and during oxygen therapy, considerable acidosis is brought about by the inhalation of carbon dioxide. Since oxygenation of the blood, which is the prime purpose of oxygen therapy, is not aided by the use of carbon dioxide, it appears unnecessary to subject patients with pneumonia to this high degree of acidosis. In addition, the excessively rapid respirations induced by carbon dioxide are an added burden to an already overburdened cardiovascular system.

The possible advantages brought forth by the proponents of carbon dioxide therapy for pneumonia, such as increased pulmonary drainage and stimulation of the circulation through the lungs, are therefore outweighed by: (1) the failure of inhalation of carbon dioxide to be of advantage in oxygenation of the blood, (2) the production of a considerable degree of acidosis and (3) the added strain which the inhalation of carbon dioxide places on the respiratory and cardiovascular system.

DISCUSSION

DR. PHILIP ARIES: What is the carbon-dioxide concentration within an oxygen tent such as is ordinarily supplied in hospitals, when occupied by a patient having pneumonia who is supplied with pure oxygen?

BODY BUILD AND DISEASE IN CHILDREN. DR. HARRY BAKWIN and DR. RUTH MORRIS BAKWIN, New York.

This paper was read before the American Pediatric Society, Cleveland, May 3, 1935, and an abstract was published in the August 1935 issue of the AMERICAN JOURNAL OF DISEASES OF CHILDREN, p. 552.

Book Reviews

Nutrition of Mother and Child. By Dr. C. Ulysses Moore. Price, $2. Pp. 258, with 46 illustrations. Philadelphia: J. B. Lippincott Company, 1935.

Moore has given an unusually clear and simple presentation of the important factors in the nutrition of mother and child. He has given enough scientific data to satisfy the intelligent mother and to secure her adherence to the principles that he lays down. Of particular interest are his chapters on the importance of breast feeding and the means available for establishing an adequate flow of breast milk. His discussion of dentition could be read with profit by many pediatricians.

Sífilis Congénita. By Alfredo Larguía. Paper. Pp. 209. Buenos Aires: "El Ateneo," 1935.

In this work the usual form for volumes of this kind is followed; that is, the chapters are on the frequency, pathology, symptoms, diagnosis and treatment of the disease discussed. The uniqueness of this work lies in the fact that, while nothing new is added to the literature, the book is excellent and well written. It could profitably be translated into English. The plates are excellent and well chosen, and any one interested in the subject would probably have no particular difficulty with the Spanish text.

Vitality. By Dr. Elizabeth Sloan Chesser. Price, $2.50. Pp. 254. New York: Oxford University Press, 1935.

This book purports to give to the laity some understanding of the fields of physiology, hygiene, psychiatry and medicine. It consists for the most part of vague generalities and trite aphorisms, and where attempts are made to give definite information much of it is inaccurate and misleading.

Rapport sur le service des enfants assistés du départment de la Seine. Part I. By Louis Mowier. Pp. 181, with 17 tables. Administration Générale de l'Assistance Publique à Paris, 1935.

This is the first part of the early report on child welfare the director of the administration of public welfare for the department of the Seine. The second part, containing financial reports and budgets, is to follow.

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Professor G. Scheltema, 6a Heereplein, Groningen, The Netherlands.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

FOREIGN

British Paediatric Association

President: Dr. Leonard Findlay, 14 Wimpole St., London, W. 1.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

Royal Society of Medicine, Section for the Study of Disease in Children

President: Sir Lancelot Barrington-Ward, 85 Harley St., London, W. 1.
Secretary: Dr. K. H. Tallerman, 122 Harley St., London, W. 1.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:30 p. m.

Paediatrický Spolok na Slovensku

President: Dr. A. J. Chura, Lazaretská 6, Bratislava, Czechoslovakia.
Secretary: Dr. S. Limbacher, Dlhá 2, Bratislava, Czechoslovakia.
Place: Pediatric Clinic, University, Bratislava. Time: Six times a year.

Sociedad Cubana de Pediatría

President: Prof. Félix Hurtado Galtés, Carlos III, 7, Havana.
Secretary: Dr. Carlos Hernández Miyares, San Lazaro 370, Havana.
Place: Cátedra de Clínica Infantil, Hospital Mercedes, Havana. Time: Third Thursday of every month.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. Ralph M. Tyson, 255 S. 17th St., Philadelphia.
Secretary: Dr. Albert D. Kaiser, 16 N. Goodman St., Rochester, N. Y.
Place: Atlantic City, N. J. Time: June 7-11, 1937.

American Academy of Pediatrics

President: Dr. Laurence R. DeBuys, 1417 Delachaise St., New Orleans, La.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Waldorf-Astoria Hotel, New York: Time: June 3, 4 and 5, 1937.
Region I. Place: Belvedere Hotel, Baltimore. Time: Nov. 16 and 17, 1936.
Region II. Place: Belvedere Hotel, Baltimore. Time: Nov. 16 and 17, 1936.
Region III. Place: Cincinnati. Time: Nov. 20 and 21, 1936.
Region IV. Place: San Francisco. Time: Oct. 22-24, 1936.

American Hospital Association, Children's Hospital Section

President: Mr. Robert Witham, Children's Hospital, Denver.
Secretary: Miss Agnes O'Roke, Kosair Crippled Children's Hospital, Louisville, Ky.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

American Pediatric Society

President: Dr. Fritz B. Talbot, 270 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid St., St. Louis.

Canadian Society for the Study of Diseases of Children

President: Dr. A. P. Hart, 1844 Bloor St., W., Toronto, Ont.
Secretary-Treasurer: Dr. Pearl Summerfeldt, Hospital for Sick Children, Toronto, Ont.

Society for Pediatric Research

President: Dr. Francis Scott Smyth, University of California Medical School, San Francisco.
Secretary: Dr. A. A. Weech, 3975 Broadway, New York.

SECTIONAL

North Pacific Pediatric Society

President: Dr. L. Howard Smith, 1020 S. W. Taylor St., Portland, Ore.
Secretary: Dr. Morris Bridgeman, Children's Clinic, Portland, Ore.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. Madison Hines Roberts, 104 Ponce de Leon Ave., N. E., Atlanta, Ga.
Secretary: Dr. Hughes Kennedy Jr., Highland Plaza Apts., Birmingham, Ala.

STATE

Alabama Pediatric Society

President: Dr. J. W. Britton, 931 Noble St., Anniston.
Secretary-Treasurer: Dr. Wallace Clyde, Employees' Hospital, Fairfield.

Arkansas State Pediatric Association

Chairman: Dr. A. C. Kirby, 701 Main St., Little Rock.
Secretary: Dr. Madeline M. Melson, 909 Main St., Little Rock.

California State Medical Society, Section on Pediatrics

Chairman: Dr. Edward B. Shaw, 384 Post St., San Francisco.
Secretary: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.

Florida State Pediatric Society

President: Dr. Luther W. Holloway, 117 W. Duval St., Jacksonville.
Secretary: Dr. Warren W. Quillian, 227 Avenue Aragon, Miami.
Place: Concurrent with state association meeting at time of convention.

Georgia Pediatric Society

President: Dr. Mercer Blanchard, 1301 Broadway, Columbus.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St., N. E., Atlanta.
Place: Atlanta. Time: December 1936.

Indiana State Pediatric Society

President: Dr. Milo K. Miller, 122 N. Lafayette Blvd., South Bend.
Secretary-Treasurer: Dr. Mathew Winters, 23 E. Ohio St., Indianapolis.
Time: Two meetings a year.

Louisiana State Pediatric Society

President: Dr. Charles James Bloom, 3439 Prytania St., New Orleans.
Secretary-Treasurer: Dr. J. A. Crawford, 834 Ryan St., Lake Charles.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. George M. Retan, 459 James St., Syracuse.
Secretary: Dr. John D. Craig, 33 E. 61st St., New York.

Michigan State Medical Society, Pediatric Section

Chairman: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Secretary: Dr. C. R. Dengler, 131 W. Michigan Ave., Jackson.

Mississippi State Pediatric Society

President: Dr. Harvey F. Garrison, 319 E. Capitol Pl., Jackson.
Secretary-Treasurer: Dr. Guy C. Jarratt, 920 Crawford St., Vicksburg.
Place: To be designated by Society. Time: Yearly.

Nebraska Pediatric Society

President: Dr. J. A. Henske, 1614 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. H. Murphy, 915 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

North Carolina Pediatric Society

President: Dr. Leroy J. Butler, 405 N. Spring St., Winston-Salem.
Secretary: Dr. C. A. Street, 405 N. Spring St., Winston-Salem.
Place: Roaring Gap. Time: August 1936.

Oklahoma State Pediatric Society

President: Dr. Julian Feild, 610 S. Monroe St., Enid.
Secretary: Dr. B. H. Nicholson, 301 N. W. Twelfth St., Oklahoma City.

Pennsylvania Medical Society, Pediatric Section

Chairman: Dr. Joseph Stokes, Children's Hospital, Philadelphia.
Secretary: Dr. Theodore O. Elterich, 310 Medical Arts Bldg., Pittsburgh.

South Carolina Pediatric Society

President: Dr. Leland B. Salters, 317 S. Warley St., Florence.
Secretary-Treasurer: Dr. D. Lesesne Smith Jr., 187 Oakland Ave., Spartanburg.

Tennessee State Pediatric Society

President: Dr. Joe T. Smith, 702 Medical Arts Bldg., Knoxville.
Secretary: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.

Texas Pediatric Society

President: Dr. George B. Cornick, 507½ E. Houston St., San Antonio.
Secretary-Treasurer: Dr. F. H. Lancaster, 1507 Medical Arts Bldg., Houston.
Place: Houston. Time: Fall, 1936.

Virginia Pediatric Society

President: Dr. Basil B. Jones, 1028 W. Franklin St., Richmond.
Secretary: Dr. W. A. McGee, 616 W. Grace St., Richmond.

West Virginia State Medical Society, Section on Pediatrics

President: Dr. John T. Thornton, 58, 16th St., Wheeling.
Secretary: Dr. Claude L. Holland, 400 Locust Ave., Fairmont.

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Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. J. D. Pilcher, City Hospital, Cleveland.
Secretary: Dr. William M. Champion, 2323 Prospect Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. T. B. Verner, 170 St. George St., Toronto.
Secretary: Dr. D. V. Hutton, 170 St. George St., Toronto.

Bronx Pediatric Society

President: Dr. Harry D. Pasachoff, 1560 Grand Concourse, New York.
Secretary: Dr. Samuel Tripler, 1555 Grand Concourse New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

Brooklyn Academy of Pediatrics

President: Dr. Thurman B. Givan, 115 Remson St., Brooklyn.
Secretary: Dr. John A. Monfort, 861 Carroll St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, July, August and September.

Central New York Pediatric Club

President: Dr. Frank Vasder Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Third Thursday of April and September.

Chicago Pediatric Society

President: Dr. A. Levinson, 30 N. Michigan Ave., Chicago.
Secretary: Dr. James H. Wallace, 715 Lake St., Oak Park, Ill.
Place: Children's Memorial Hospital, 710 Fullerton Ave. Time: Third Tuesday of each month.

Dallas Pediatric Society

President: Dr. I. T. Nesbitt, 1719 Pacific Ave., Dallas, Texas.
Secretary: Dr. John E. Ashby, 614 Medical Arts Bldg., Dallas, Texas.
Place: Bradford Memorial Hospital. Time: 1 p. m., first and third Saturdays of each month.

Detroit Pediatric Society

President: Dr. Edward A. Wishropp, 5057 Woodward Ave., Detroit.
Secretary: Dr. W. J. Scott, 5140 Second Ave., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Joseph Yampolsky, 478 Peachtree St., Atlanta.
Secretary: Dr. T. I. Willingham, 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Hezekiah Beardsley Pediatric Club of Connecticut

President: Dr. H. W. Brayton, 179 Allyn St., Hartford.
Secretary: Dr. Ernest Caulfield, 683 Asylum Ave., Hartford.

Houston Pediatric Society

President: Dr. E. O. Fitch, 3717 Main St., Houston, Texas.
Secretary-Treasurer: Dr. Fred Ames, Medical Arts Bldg., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

Intermountain Pediatric Society

President: Dr. Eugene Smith, 385 Twenty-Fourth St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 837 Boston Bldg., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

Kansas City (Missouri) Pediatric Society

President: Dr. Harry M. Gilkey, 1103 Grand Ave., Kansas City.
Secretary: Dr. S. A. Stadler, 6133 Brookside Blvd., Kansas City.
Place: Kansas City General Hospital. Time: On call.

Los Angeles County Medical Association, Pediatric Section

President: Dr. George P. Laton, 1136 W. 6th St.
Secretary-Treasurer: Dr. Edwin F. Patton, 3875 Wilshire Blvd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd.
Time: Second Monday of February, April, June, October and December.

Medical Society of the County of Kings and the Academy of Medicine of Brooklyn, Pediatric Section

President: Dr. Harry Apfel, 988 Park Pl., Brooklyn.
Secretary: Dr. Max Palinsky, 1270, 45th St., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: Third Wednesday of each month, October to May.

Medical Society of the County of Queens, Inc., Section on Pediatrics

Chairman: Dr. W. C. A. Steffen, 42 Union St., Flushing, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144, 38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May.

Memphis Pediatric Society

President: Dr. W. D. Mims, 1042 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. R. Graves, 1193 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month, except June, July and August, 8 p. m.

Milwaukee Pediatric Society

President: Dr. J. Gurney Taylor, 324 E. Wisconsin St., Milwaukee.
Secretary: Dr. H. B. Miner, 425 E. Wisconsin Ave., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New England Pediatric Society

President: Dr. Paul Emerson, 319 Longwood Ave., Boston.
Secretary-Treasurer: Dr. Henry E. Gallup, 66 Commonwealth Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Béla Schick, 17 E. 84th St., New York.
Secretary: Dr. Alexander T. Martin, 107 E. 85th St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northwestern Pediatric Society

President: Dr. A. V. Stoesser, University Hospital, Minneapolis.
Secretary: Dr. Roger L. J. Kennedy, Mayo Clinic, Rochester, Minn.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

Philadelphia Pediatric Society

President: Dr. H. H. Perlman, 1904 N. Franklin St., Philadelphia.
Secretary: Dr. James E. Bowman, 4091 Comly St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. George J. Feldstein, 3401 Fifth Ave., Pittsburgh.
Secretary-Treasurer: Dr. E. R. McClusky, 3200 Fifth Ave., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Tuesday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. W. E. Chapin, 1001 E. Clay St., Richmond, Va.
Secretary-Treasurer: Dr. Emily Gardner, 1100 W. Franklin St., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

Rochester Pediatric Society

President: Dr. F. W. Bush, 29 N. Goodman St., Rochester, N. Y.
Secretary: Dr. David Wolin, 16 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month.

Rocky Mountain Pediatric Society

President: Dr. Ralph Verploeg, 1850 Gilpin St., Denver.
Secretary: Dr. Max M. Ginsburg, Metropolitan Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 2:30 p. m.

St. Louis Pediatric Society

President: Dr. J. V. Cooke, St. Louis Children's Hospital, St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, Beaumont Bldg., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. Arthur E. Wade, 1215, 4th Ave., Seattle.
Secretary: Dr. Walter B. Seelye, Cobb Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

Southwestern Pediatric Society

President: Dr. Victor E. Stork, 1136 W. Sixth St., Los Angeles.
Secretary: Dr. Howard R. Cooder, 3875 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Samuel Levin, 2501 W. Grand Blvd., Detroit.
Secretary: Dr. D. Murray Cowie, University of Michigan, Ann Arbor, Mich.

Westchester County Medical Society, Pediatric Section (New York)

President: Dr. Louis V. Waldron, 149 N. Broadway, Yonkers, N. Y.
Secretary-Treasurer: Dr. Fairfax Hall, 421 Huguenot St., New Rochelle, N. Y.
Place: Grasslands Hospital. Time: Third Thursday, Oct., Dec., Feb. and April.